AVIATION WEEK

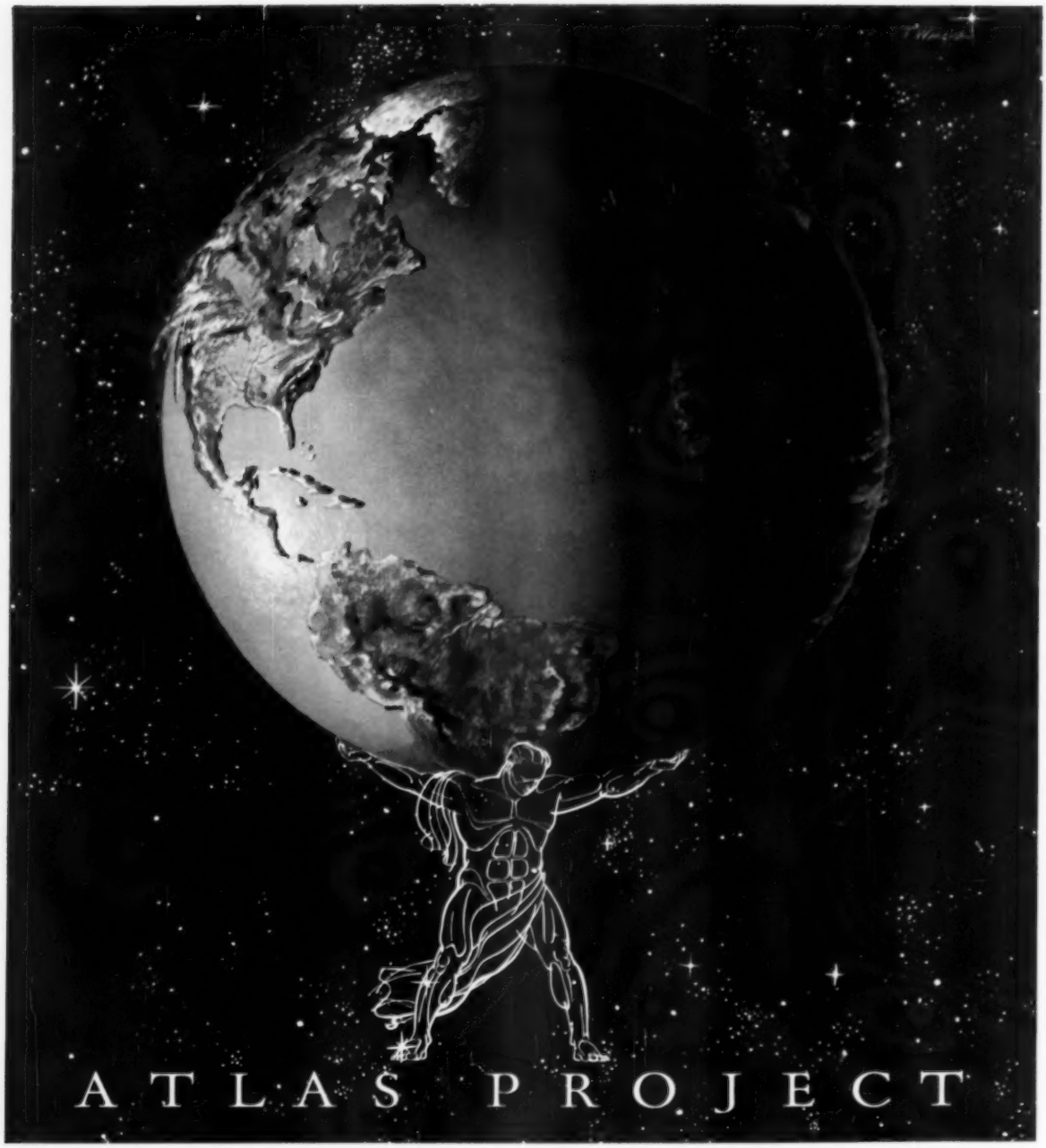
A McGRAW-HILL PUBLICATION

July 30, 1956 50 cents

More Explosive Cartridge Devices Used on Aircraft

C-130s

CAB Analyses Mid-Air Collision Threat



Convair's Atlas... a key to ultimate peace!

A TOP PRIORITY PROJECT OF THE U. S. AIR FORCE

Convair's intercontinental ballistic missile, a vital weapon for our national security, is aptly named Atlas. As a deterrent to war—a force for world peace—it literally can sustain the future freedom of all mankind!

For ten years Convair's **Engineering to the Nth Power** has led the way in the development of the ICBM. Today, Convair continues its leadership with the largest and most experienced organization in the astronautics field. **CONVAIR-*Astronautics*** is now building a complete facility in San Diego, California, to produce the Atlas... a key to ultimate peace!

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION

FAIRCHILD

F-27 Friendship

The following airlines have ordered Fairchild F-27 propjet transports:

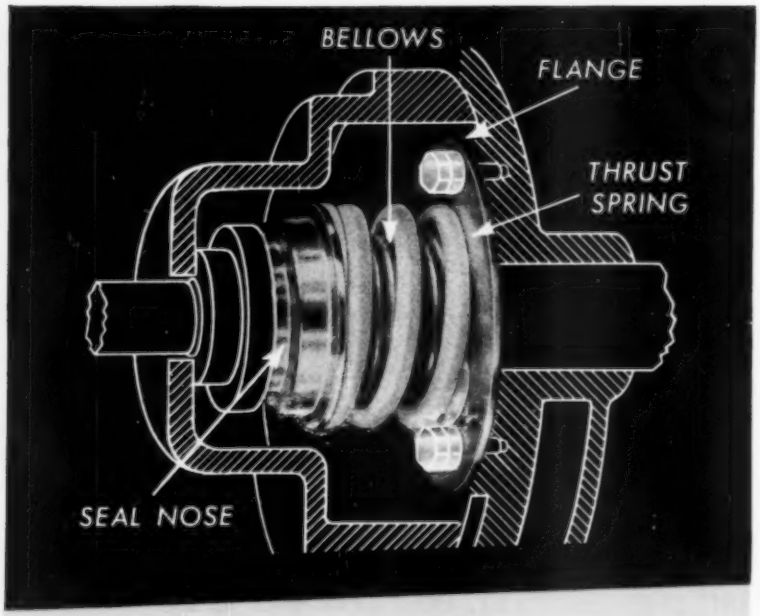
Bonanza Air Lines *Frontier Airlines* *Mackey Airlines*
Piedmont Airlines *West Coast Airlines*

These airlines will be serving 125 cities starting in late 1957 and 1958

The exciting new Fairchild F-27 is tailored to the needs of the airline operator . . . conceived for the comfort of the air traveler. Among its features are: Rolls-Royce Dart propjet engines, 280 mph cruising, 2250 mile range, 40 passengers, lowest operating costs, small field performance and pressurization. For the full F-27 story, for a preview of the effect of this new propjet transport on your airline or company operations, write to: R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine and Airplane Corporation, Hagerstown 15, Maryland.

FAIRCHILD
F-27 Friendship

THE FINEST AIRCRAFT FOR AIRLINES,
CORPORATIONS AND MILITARY SERVICES



HOW TO LEAKPROOF SHAFTS AT HIGH TEMPERATURES

It makes no difference whether you expose them to a -100°F. deep freeze or a singeing 600°F. Fulton Sylphon rotary bellows seals will still leakproof rotating shafts against corrosive, explosive or contaminating fluids and gases.

One reason is that this seal features a seamless, flexible metal bellows which expands, contracts and deflects to apply the proper sealing pressure at all times. Furthermore, the Fulton Sylphon bellows seal is made with silver solder for extra high-temperature protection.

You can obtain Fulton Sylphon bellows seals in rotating or stationary types for pressures up to hundreds of pounds and shaft speeds up to 20,000 RPM. For the atomic energy and other industries, they're also available with welded construction to solve special contamination problems.

SEND FOR BULLETIN PA-827

V-FACE SEALS

Formerly called flat seals, Fulton Sylphon V-FACE Seals assure leakproof sealing of flat surfaces at temperatures from -100°F. to 800°F. and at pressures up to 5,000 psi.

Mr Controls

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION • Knoxville 1, Tenn.

AVIATION CALENDAR

July 31-Aug. 9—23rd Annual U.S. National Soaring Competition. **Aug. 5**—Air Show, Grand Prairie Airport, Texas.

Aug. 1-5—Air Force Association's 1956 National Convention and Airpower Panorama, Roosevelt Hotel, New Orleans, La.

Aug. 6-8—Society of Automotive Engineers National West Coast Meeting, Mark Hopkins Hotel, San Francisco, Calif.

Aug. 7-9—Air Transport Association Standard Practices Committee Meeting, Palace Hotel, San Francisco, Calif.

Aug. 15-17—Institute of the Aeronautical Sciences, National Turbine-Powered Air Transportation Meeting, Grand Hotel, San Diego, Calif.

Aug. 22-24—Bendix Aviation Corp.'s 1956 International Ignition Conference, Sidney, New York.

Aug. 27-29—Association for Computing Machinery, University of California Westwood Campus, Los Angeles.

Sept. 1-3—1956 National Aircraft Show, Oklahoma City.

Sept. 3-7—Canadian National Air Show, Toronto, Canada.

Sept. 4-6—Society of British Aircraft Constructors' 17th Annual Air Show, Royal Aircraft Establishment, Farnborough.

Sept. 9-11—International Northwest Aviation Council, 20th annual convention, Boise, Idaho.

Sept. 10-14—American Society of Mechanical Engineers, Instruments & Regulators Div. Meeting, Detroit, Mich.

Sept. 16-22—American Society for Testing Materials, Second Pacific National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles.

Sept. 17—International Air Transport Association, 12th annual general meeting, Edinburgh, Scotland.

Sept. 17-21—Eleventh Annual Instrument-Automation Conference & Exhibit, sponsored by the Instrument Society of America, Coliseum, New York, N. Y.

Sept. 17-22—International Congress of Astronautics, sponsored by the International Astronautic Federation, Rome, Italy.

Sept. 23-26—American Society of Mechanical Engineers, Petroleum Conference, Hotel Statler, Dallas, Tex.

Sept. 24-28—1956 Trade Fair of the Atomic Industry, Navy Pier, Chicago.

AVIATION WEEK • JULY 30, 1956
Vol. 65, No. 5

Published weekly with an additional issue in December by the McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. Executive, Editorial, Advertising and Subscription offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Offices: 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Paul Montgomery, Executive Vice-President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph T. Allen, Vice President and Director of Advertising Sales; J. E. Blackburn, Jr., Vice President and Circulation Director.

Subscription: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow 10 days for change of address.

Subscriptions are solicited only from persons who have a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.

Single Copies 50c. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere and the Philippines $10 a year; $18 for two years; $26 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Second class mail privileges authorized at Albany 1, N. Y. Printed in U. S. A.

Copyright 1956 by McGraw-Hill Publishing Co. Inc. All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

Phillips 66
PRESENTS
MILESTONES IN AVIATION

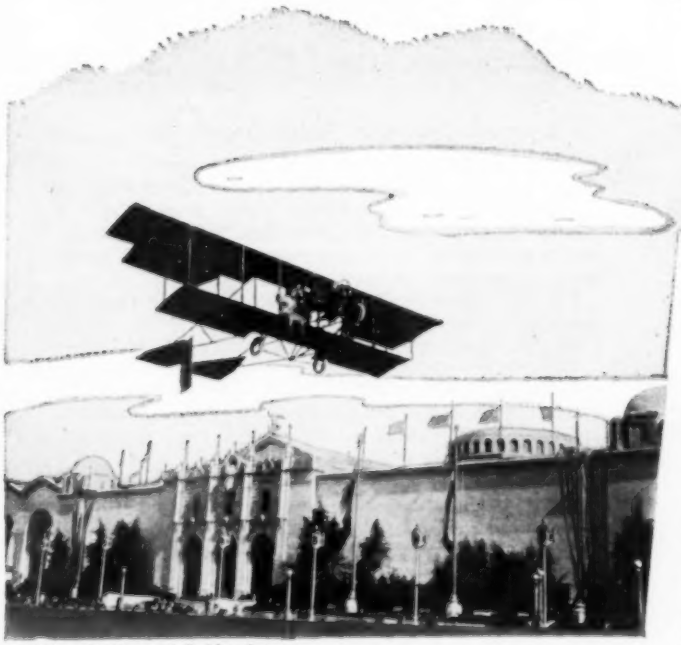
Bird Boy Art Smith

Whenever daring exploits of pioneer aviators are chronicled, the name of Bird Boy Art Smith is sure to appear. From the time he flew his first Curtiss-type biplane in 1911 until his death in 1926, Art Smith dedicated his life to aviation.

The romance of his life was heightened by the unselfish encouragement of his mother and father, who mortgaged their home so that their son could have the money to build his first airplane. Another inspiration of his early years was his sweetheart, Aimee Cour. They eloped in 1912 in what is considered to be the world's first airplane elopement.

Flying in such places as Deadwood, S. Dakota, and in the capital of Japan, Art Smith set the world record for looping the loop, pioneered sky writing and invented dozens of breath-taking stunts to win acclaim of millions throughout the world.

The custom of showing admiration for Art Smith's flying by giving him a medal started with a flight he made in the Black Hills in 1912. One of his most prized awards was a gold nugget, given him by his hero, Buffalo Bill.



Photos Courtesy of Smithsonian Institution, National Air Museum

Phillips 66
AVIATION PRODUCTS

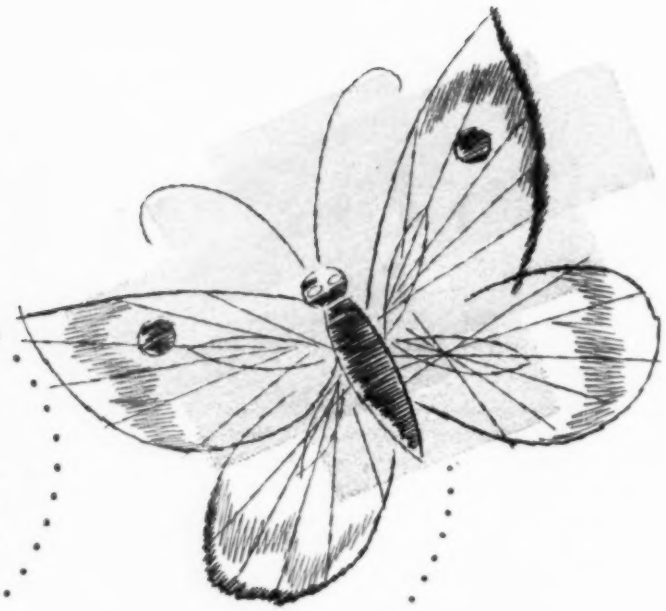
It's Performance that Counts!

A pioneer in research and manufacturing to meet aviation needs, Phillips Petroleum Company continues its leadership as a supplier of high octane gasoline and new *super performance* Jet Fuels for today's aircraft.

Since aviation's early days, Phillips has taken an active part in setting up higher standards for aviation fuel. In fact, Phillips pioneered in producing such important Avgas components as HF Alkylate and Di-isopropyl.

In aircraft fuels, it's performance that counts. And military and commercial operators know they get *super* performance from Phillips 66 products.

AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA



LIGHT
FOR
FLIGHT

ARC's new ADF weighs less than 20 lbs!

TYPE 21 ADF WEIGHS ONLY 19.7 POUNDS

Component Units Weights: Receiver, 6.8 lbs.; Loop, 4.3 lbs.; Loop Housing, 0.5 lbs.; Control Unit, 1.6 lbs.; Indicator, 1.3 lbs.; Power Unit, 5.2 lbs.
CAA Type Certificated

Fly light and navigate . . . better than ever before!

ARC's miniaturized Automatic Direction Finder is making aviation news. It offers *reliability* proved in two years of testing. The entire system weighs less than 20 pounds. Now you can have a DUAL installation where required—at a weight saving of 80 pounds or more.

The ADF still is the world's Number One navigational aid, usable on an estimated 60,000 radio stations. Now you can have ADF featuring ARC standards of performance and reliability. This system incorporates hermetic sealing of critical components such as the entire loop assembly. It also has other mechanical features designed and tested for dependability under today's higher speeds and more exacting operational and environmental conditions.

The Type 21 ADF covers all frequencies from 190 kc to 1750 kc. It requires less power—only 2.8 amps at 27.5 volts dc input. Extremely low drag of the loop is an outstanding feature. Housing extends only 2 inches from the skin of the aircraft.

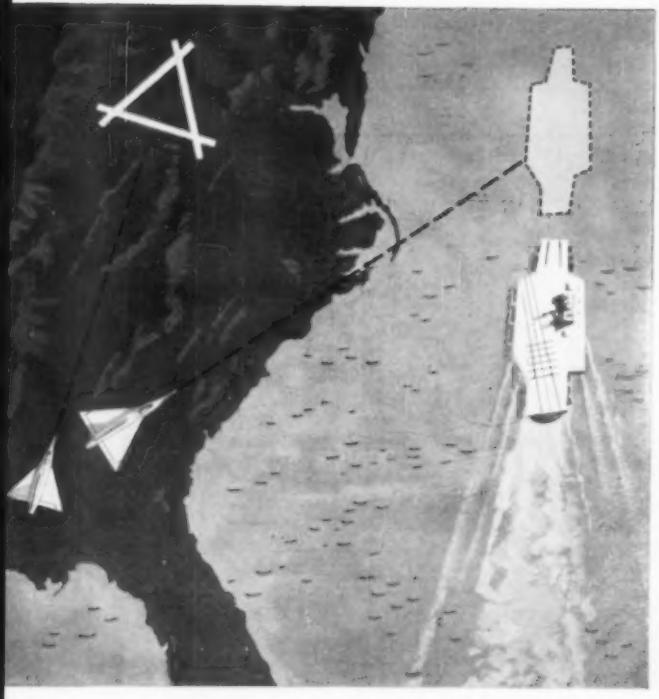
Now make room for more payload and other equipment. Fly with ARC-reliability, less weight, less space, less drag. Ask your dealer for complete details.

Omni/ILS Receivers • Course Directors • UHF and VHF Receivers and Transmitters
LF Receivers and Loop Direction Finders • 10-Channel Isolation Amplifiers • 8-Watt Audio Amplifiers • Interphone Amplifiers • Omnirange Signal Generators and Standard Course Checkers • 900-2100 Mc Signal Generators

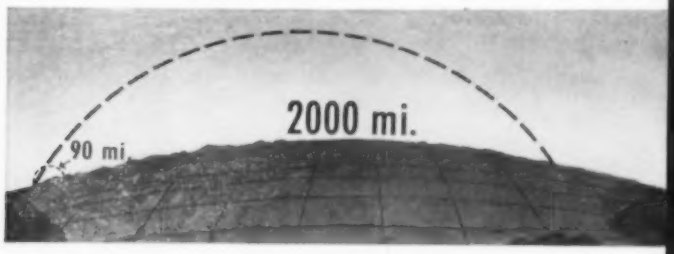
Dependable Airborne Electronic Equipment Since 1928

Aircraft Radio Corporation BOONTON, NEW JERSEY

Here's why BENDIX SELF-CONTAINED NAVIGATIONAL COMPUTERS can master aircraft navigation problems anywhere

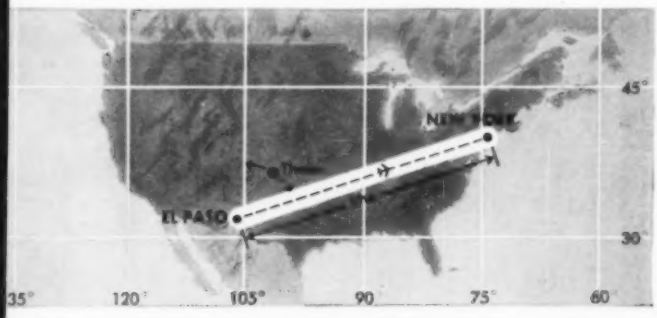


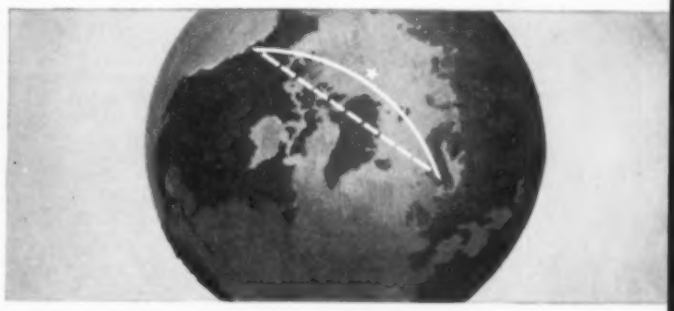
3 ALSO LATITUDE-LONGITUDE TYPE. Another basic type of Bendix Computer fixes destinations from coordinates. For rugged reliability, all designs are completely transistorized; presentation of information is by latest techniques, including cathode ray pictorial display.



1 BOTH FIXED AND MOVING TARGETS. Bendix Self-contained Navigational Computers will direct the course to any fixed target . . . or a lead collision course to any moving target . . . and will continuously indicate position with respect to earth, destination, or point of intercept.

4 FOR SHORT AND LONG RANGE. Effective operation of these self-contained Bendix units ranges from distances of less than 100 miles on up to 2000-mile flights. A big advantage of buying Bendix is that units can be tailored and packaged to meet any set of requirements.





2 RHO-THETA TYPE, IF DESIRED. Bendix experience is diversified and covers all types of computers—rho-theta, for example—for any desired method of navigation. So flexible are Bendix Computers that they can be built for *slaving to radio navigation aids* at the operator's choice.

5 GREAT-CIRCLE OR RHUMB-LINE NAVIGATION. Navigation around the world, *or over the poles*, by great circle or rhumb line, can be handled with equal facility and accuracy. A design feature of Bendix Computers is compactness and light weight. Some weigh as little as 12 lbs.

THE DESIGN AND MANUFACTURE of specialized navigational instruments, systems and components for aircraft have been our business for nearly four decades. Whatever your navigation problems might be, we'd welcome an opportunity to submit a proposal for your specific needs. ECLIPSE-PIONEER DIVISION, BENDIX AVIATION CORPORATION, TETERBORO, N. J.

West Coast Offices: 117 E. Providencia, Burbank, Calif.
Room 114, Administration Bldg., Boeing Field, Seattle 8, Wash.
Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N.Y.

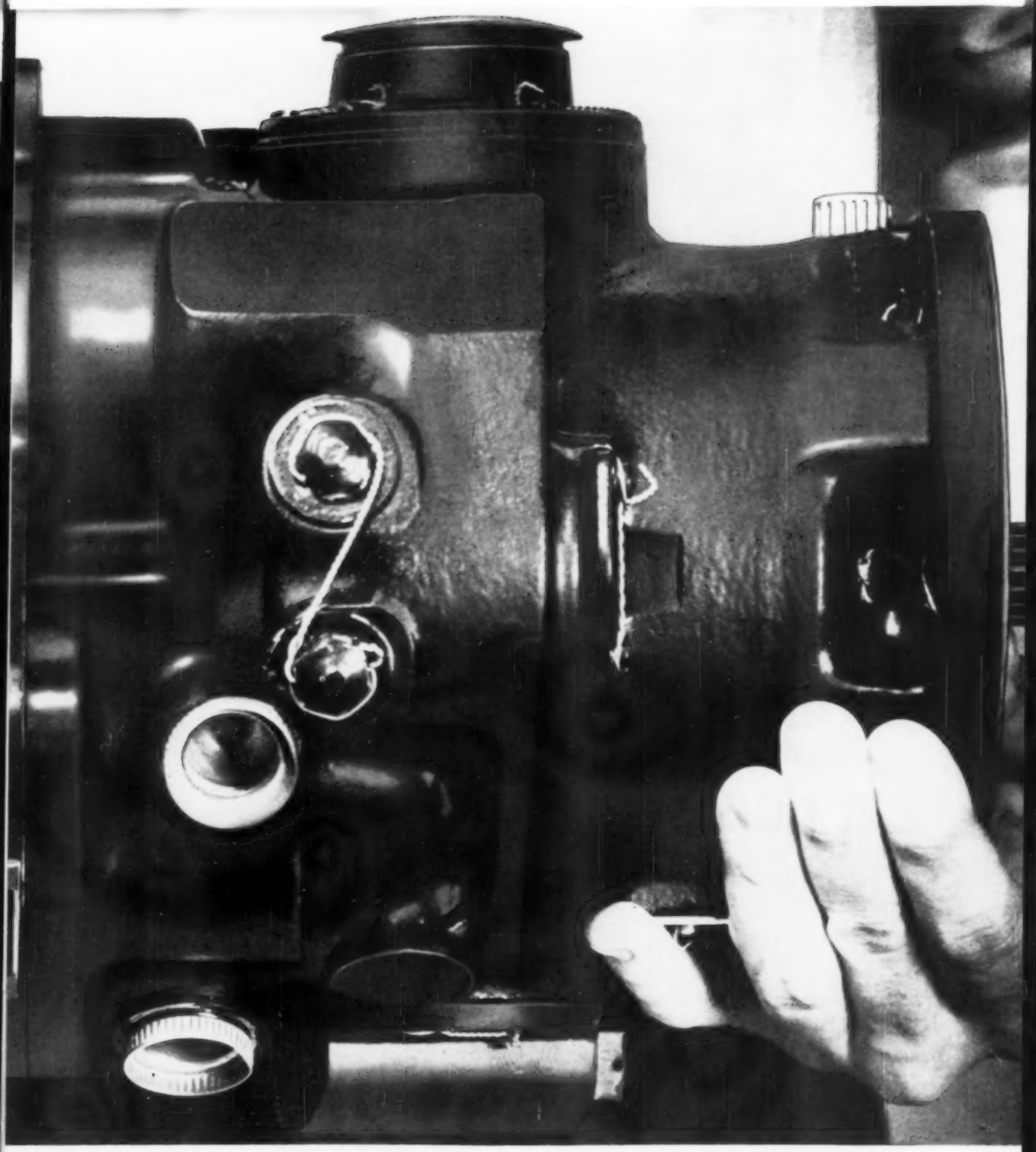
Eclipse-Pioneer DIVISION

Bendix AVIATION CORPORATION

ACTUAL SIZE photograph illustrates the small size (length 16.25 inches) of this 73-pound, 20-KVA, Constant Frequency Power Package. This integrated drive-generator maintains constant, 400-cycle output frequency over an input speed range of 4200 to 7500 rpm.

GENERAL ELECTRIC ANNOUNCES . . .

NEW CONSTANT FREQUENCY POWER PACKAGE



The constant frequency required for optimum performance of electronic equipment in modern aircraft is now possible with a single, compact unit. The new G-E generator-drive package combines the functions of the hydraulic ball-piston constant speed drive and a statically excited generator into a integrated unit, smaller and lighter than any conventional drive and generator combination of the same rating. In addition, this new generator has all the inherent safety and performance features of the G-E Hydraulic Constant Speed Drive and the Statically Excited Generator. Please contact your nearest General Electric Aviation and Defense Industry Sales representative for complete details. General Electric Company, Schenectady 5, New York. 210-101

Progress Is Our Most Important Product

GENERAL ELECTRIC

Corporate aircraft stay on the job with Van Dusen service. This plane, owned by a large corporation, is an international traveler and a regular caller.

Van Dusen knows a good thing...

and so does Shell

What a difference when a dealer "flies with Shell." For example, take the experience of Van Dusen Aircraft, Shell aviation dealer, at Logan International Airport, Boston.

As John Myers, Van Dusen manager, puts it, "Being a Shell Dealer means a lot in this business. You've got to have the right equipment and the right products because ground time is expensive and schedules must be met."

A private plane ready-to-roll—Van Dusen serviced.

"We're on top on both counts. With a full line of dependable Shell aviation products and the very latest Shell equipment, we can give every flier just what he wants—*on-schedule service.*

"Take the businessman who flies. Here in New England, the corporate aircraft market is expanding like sixty. Our service roster includes names like U. S. Steel and IBM because Shell has helped us know the needs of the corporate flier and we're equipped to give him top-notch service.

"Let me tell you how. Frequent visits from our Shell aviation specialist show us new ways to build the kind of service fliers want. We've got a direct pipeline right into all that Shell know-how. In addition, every issue of the Shell Dealer magazine gives us merchandising tips on better ramp service.

Van Dusen refuels BOAC airliner for trip to Europe.

"Equally important, is the Shell Credit Card system. Every year we service hundreds of new customers who use Shell Credit Cards. It's another Shell service that really saves the flier lots of time and bother.

"And it's the same story with commercial airlines, too. Shell's experience and contacts are always available to help us get new business."

Manager John Myers, of Van Dusen Aircraft Supplies, explains his company's ground-floor position in New England's aviation boom.

It takes the proper equipment to deliver the last word in service. The Shell fuel truck is familiar to more air travelers than any other.

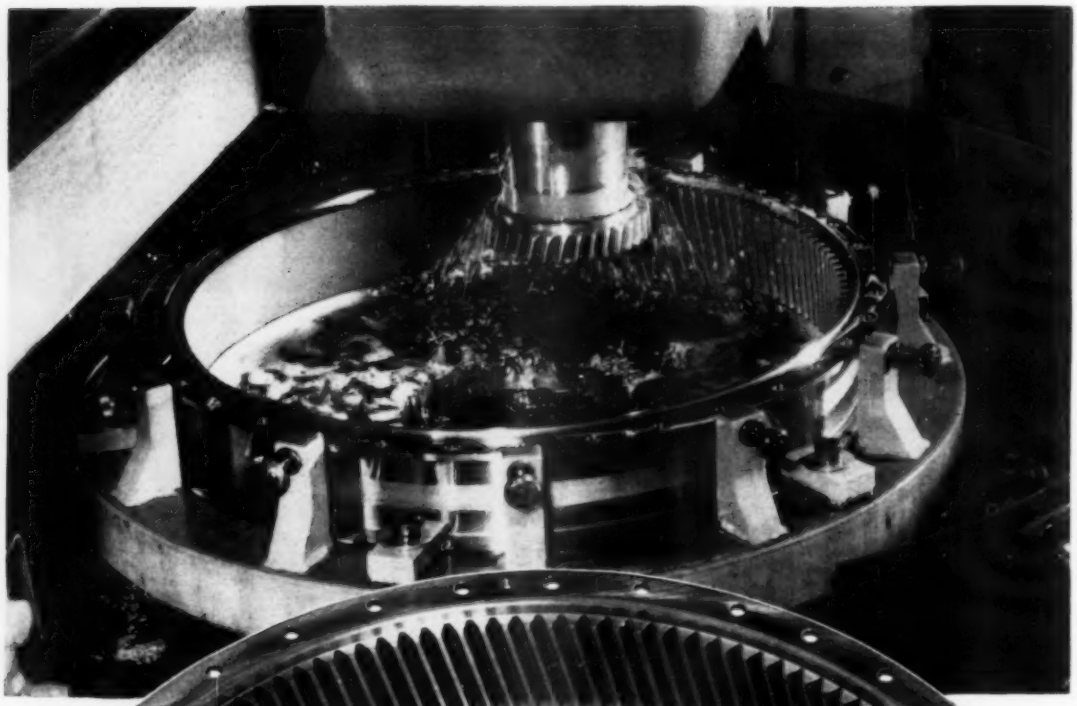
As soon as you taxi up, Van Dusen is there with service.

It pays to be a Shell Aviation Dealer

—and the Shell office nearest you will be glad to show you why

SHELL

and then we built



This 7 pitch, 19.1564″ pitch diameter internal gear for the Sikorsky S-58 Main Transmission

This HARD (Rockwell "50C") gear is cut after heat treating to master gear standards:

.0002″ per inch maximum lead error
+.0000 −.0003 involute error
.0002″ tooth spacing tolerance
60 RMS finish

INDIANA GEAR

INDIANA GEAR WORKS, INC. • INDIANAPOLIS, INDIANA

If you've got fuel valves on your mind

now, more than ever,

Hydro-Aire fuel gate valves are way **ahead.** Check these features:

All moving seals are teflon.

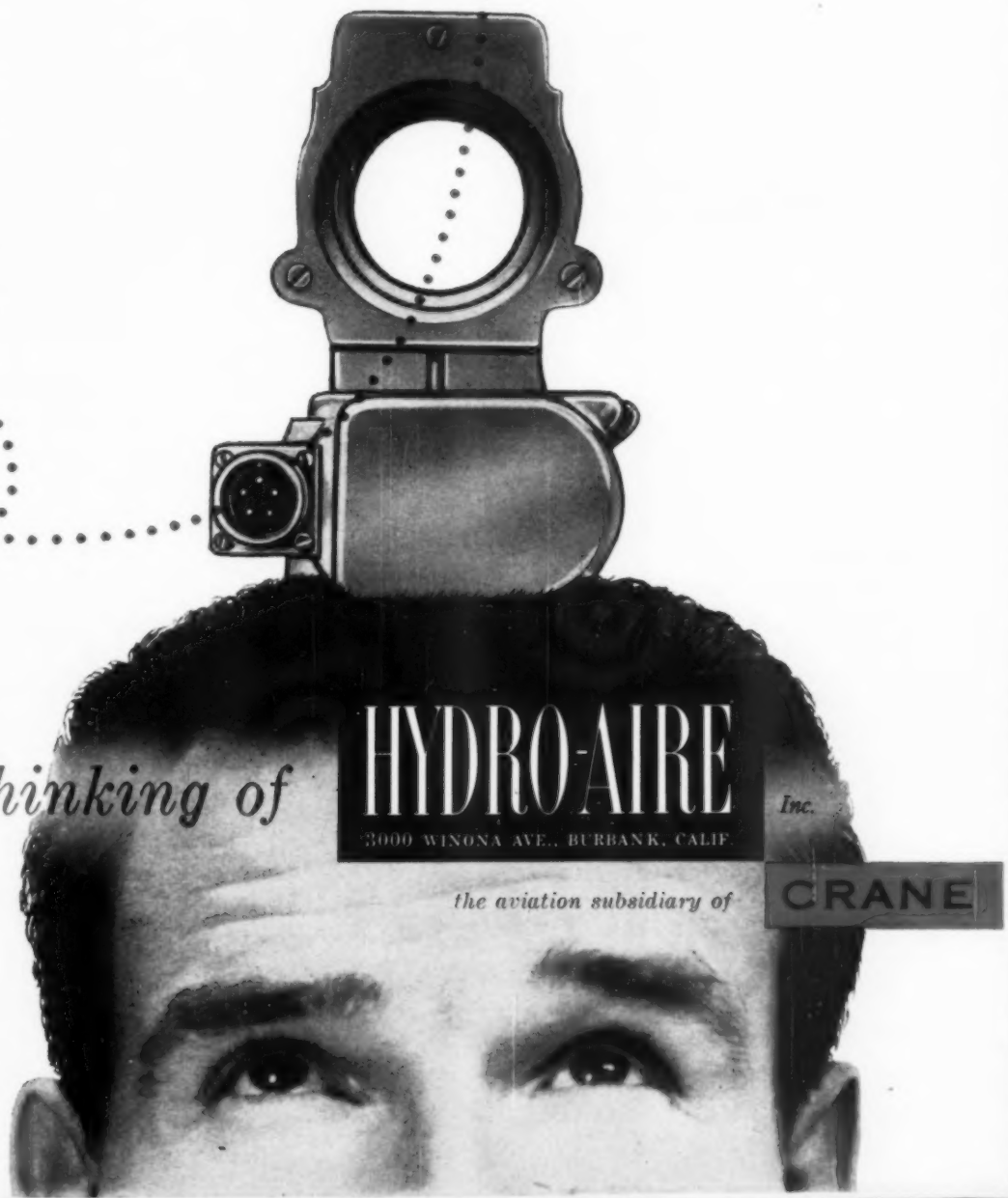
Sealed actuator protects the motor and makes the unit explosion proof.

Simple design means easier maintenance, fewer parts.

Basic design provides for thermal reliefs at little additional cost.

Now in quantity production in all standard sizes. Write for complete details.

P.S.: We also make hot air valves, HY-V/L pumps and the "Hytrol" Anti-Skid Braking System.



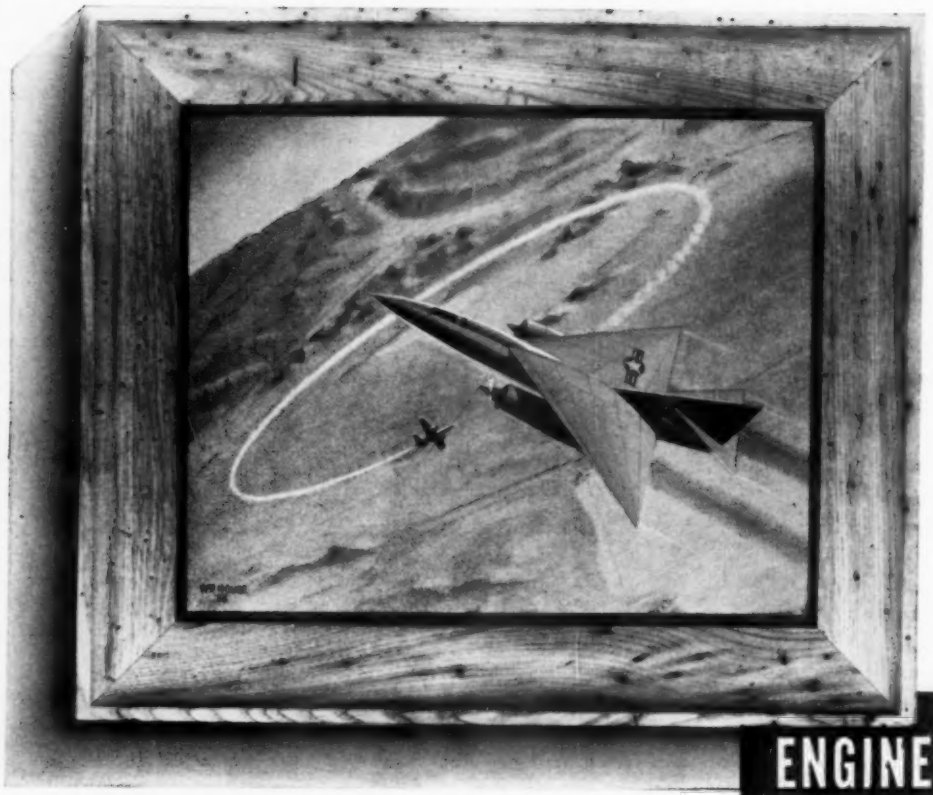
ou must be thinking of

HYDRO-AIRE *Inc.*

3000 WINONA AVE., BURBANK, CALIF.

the aviation subsidiary of CRANE

Every Fighter, Every Bomber, Every Transport is Hydro-Aire Equipped



The art of rocketry

The portraits of tomorrow's propulsion systems are rapidly becoming realities at Aerojet-General. America's foremost manufacturer of rocket powerplants, Aerojet is a major contributor to this nation's most critical rocket and missile programs.

But creation takes talent.

Operations at Aerojet's California plants, near Los Angeles and Sacramento, are expanding rapidly. Unparalleled career opportunities exist for scientific and engineering personnel at all levels of experience.

Please write the Director of Personnel, Aerojet-General Corp., *Box 296, Azusa, Calif.* or *Box 1947, Sacramento, Calif.*

Your resume will receive immediate, confidential attention.

ENGINEERS
ALL FIELDS

CHEMISTS

PHYSICISTS

MATHEMATICIANS

METALLURGISTS

DRAFTSMEN

ENGINEERING DRAWING CHECKERS

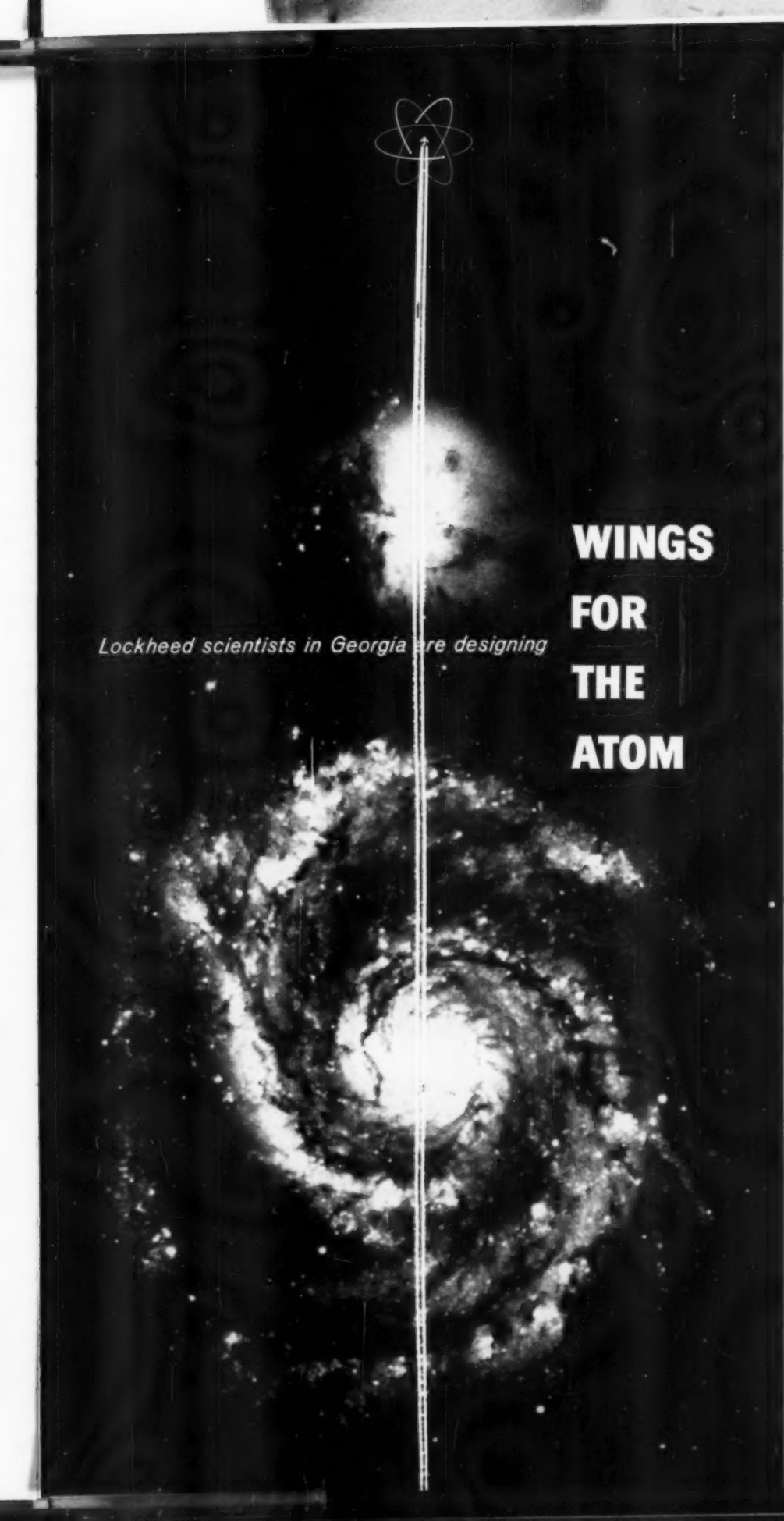
Aerojet-General CORPORATION

A Subsidiary of
The General Tire & Rubber Company

THE GENERAL TIRE

AZUSA, CALIFORNIA
SACRAMENTO, CALIFORNIA

MORE POWER FOR AIR POWER



Lockheed scientists in Georgia are designing

WINGS FOR THE ATOM

Domesticating the atom to serve mankind has intrigued science for over a decade. One top priority application, secretly under way for several years at Lockheed: developing a nuclear-powered plane as different from present types as a supersonic jet is from the first stick-and-wire biplane.

IMAGINE A GIANT AIRCRAFT SOARING ALOFT, NOT WITH TONS OF GASOLINE, BUT WITH A URANIUM FUEL SUPPLY NO BIGGER THAN A HANDFUL OF GRAVEL. EVENTUALLY, SUCH A PLANE-OF-THE-FUTURE—WITH THIS SCANT FUEL SUPPLY—WILL GIRDLE THE GLOBE NON-STOP BETWEEN SUNRISE AND SUNSET.

More than a dream, this incredible aircraft is now being developed by Lockheed for the U.S. Air Force despite problems of propulsion, structures and materials, thermodynamics, crew survival, producibility and maintenance unique in aviation. Old concepts are being shelved, traditional solutions rejected. *The kind of aeronautical advances that once took a generation of research are now being telescoped into a few months, even weeks.*

Soon several hundred nuclear scientists and engineers from Lockheed's Georgia Division will move to the North Georgia mountain country. There, on a vast site—some 40 miles from U.S. Air Force Plant No. 6 at Marietta, operated by Lockheed—will be built the nation's largest facility for the development of atomic-powered aircraft.

The exact status today of the atomic plane is still a military secret. But this much can be said: The first nuclear aircraft to blaze across America's skies may not look essentially different from conventional planes, but functionally it can only be described as revolutionary. And after the nation's military requirements are met, the transports then available to you as a traveler will rank among the truly exciting events of aviation history.

YOU YOURSELF MAY THEN TRAVEL ABOARD A NUCLEAR-POWERED AIRLINER—CROSSING THE COUNTRY IN AN HOUR OR TWO, OR SPANNING THE ATLANTIC IN LESS TIME THAN IT NOW TAKES TO GO FROM CHICAGO TO NEW YORK.

Challenging opportunities in aircraft and nuclear work are available for outstanding scientists and engineers. Inquiries invited.

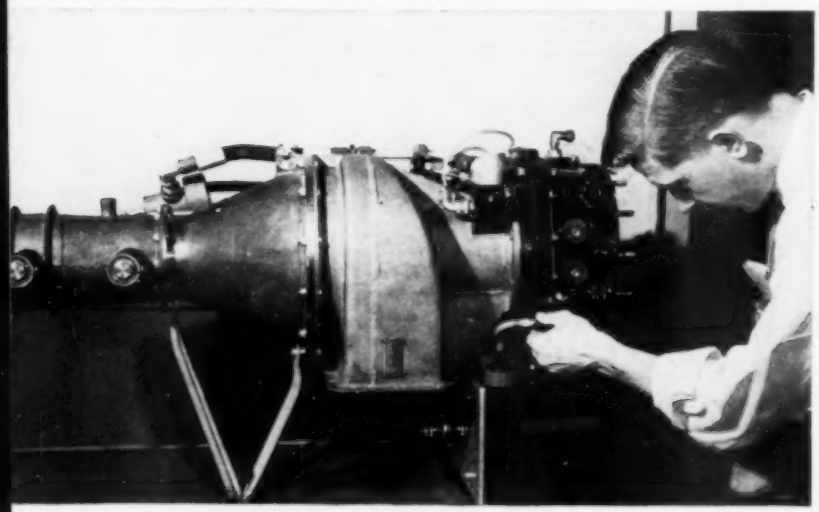
LOCKHEED

Aircraft Corporation

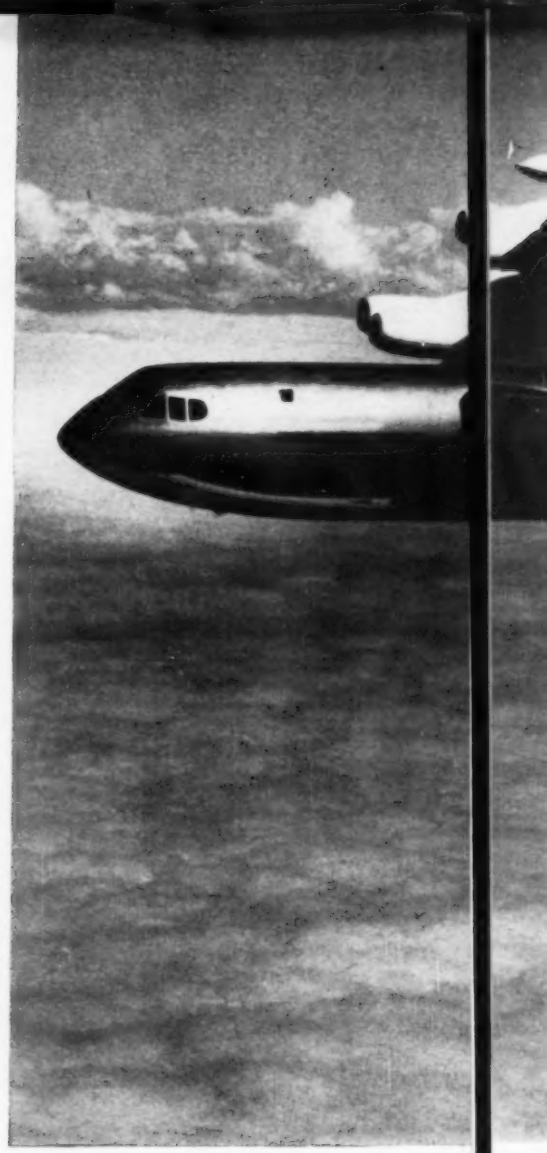
GEORGIA DIVISION, MARIETTA
AIR FORCE PLANT NO. 6

LOOK TO LOCKHEED FOR LEADERSHIP

G-E TURBOPUMPS ON THE B-52 are driven by air ducted from the jet engines. These units supply the hydraulic power necessary to operate the bomber's steering, empennage surfaces, landing gear, bomb-bay doors, and wing spoilers.



G-E TURBODRIVES ON THE B-52 also operate on air ducted from the engines. These constant-speed drives each turn a 60-kva, 400-cps alternator which produces electricity for the B-52's radar, lighting, armament, and control panels.



New General Electric Air-turbine Drives Save

The Boeing B-52 Stratofortress, newest Air Force jet bomber, uses General Electric turbopumps and turbodrives to help supply its hydraulic and electric power. Chalking up more than 100,000 hours operating time, these weight-saving power packs have helped to make the giant bomber one of the most advanced aircraft in the world today.

OPERATING ON THE SIMPLEST OF PRINCIPLES, G-E turbopumps and alternator drives consist only of a turbine, gearing, and integral lubrication and control systems. Because their basic design requires very few moving parts, G-E turbopumps and drives are engineered to give long, dependable service under the most stringent operating conditions.

COMPACT AND SELF-CONTAINED, these units are located near the point where power is needed. Such versatile, remote location reduces "drag" by cutting engine nacelle size, and eliminates the weight of long

Progress Is Our Most Important Product

GENERAL ELECTRIC

THE B-52—first aircraft in history to use pneumatic-driven power equipment for operating its entire accessory system.

Weight, Permit Increased B-52 Performance

transmission lines. The lighter system weight obtained with G-E turbopumps and drives permits increased aircraft range, speed, or payload.

TOP RELIABILITY OF AIR-TURBINE DRIVES is achieved by cross-manifolding the plane's air supply ducts. Through this method, all drives aboard the aircraft can be operated on air from one or any combination of engines.

FOR DETAILED INFORMATION on how G-E turbopumps and turbodrives, manufactured by General Electric's Aircraft Accessory Turbine Department in Lynn, Mass., can answer the accessory power needs of your aircraft, contact your General Electric Aviation and Defense Industries Sales Office, or clip coupon for free descriptive bulletins. 231-7

General Electric Co., Section 231-7
Schenectady 5, N. Y.

Please send me bulletins GEA-5870A, GEA-6333 and GER-973 on turbopumps and drives.

I am requesting this information

☐ for immediate project

☐ for Reference only

Name .....

Position .....

Company .....

City ..... Zone ..... State .....

AIRBORNE FINGERPRINTS

— new air traffic safety by Stewart-Warner Electronics

Now, the new Stewart-Warner Electronics Airborne Safety Beacon makes it possible for every plane in the air to carry identification as positive as your own fingerprints. Stewart-Warner Electronics, the pioneer and builder of the first airborne safety beacons, which were tested by the Air Navigation Development Board and CAA, now offers airline and other aircraft owners automatic identification for greater air traffic safety.

The new beacon combines all the reliability and long-life factors of airborne military equipment supplied by Stewart-Warner Electronics to the services since 1942. This rugged equipment incorporates ARINC tubes and is designed to meet specifically characteristics No. 532-A.

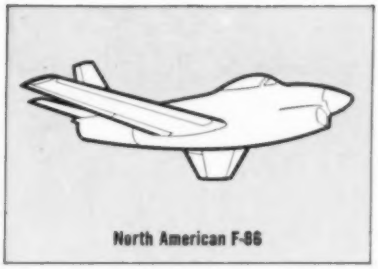
CAA is now planning to install interrogators on ASR radar at all major air terminals to improve air safety. Be sure you take advantage of this program by installing an S-W Electronics Air Safety Beacon. Write today for full details from our Civil Aviation Department 14. Stewart-Warner Electronics, 1300 North Kostner Avenue, Chicago 51, Illinois.

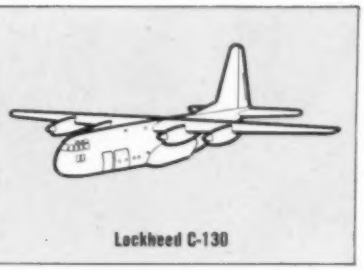
STEWART SW WARNER ELECTRONICS

a Division of Stewart-Warner Corporation

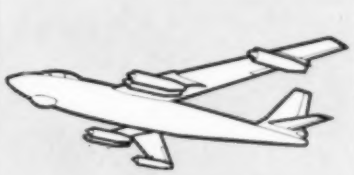
SOLAR

MARK OF HIGHEST QUALITY SINCE 1927

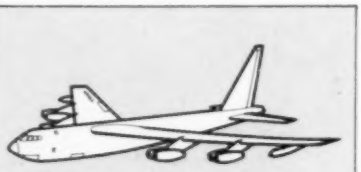

North American F-86


Lockheed C-130

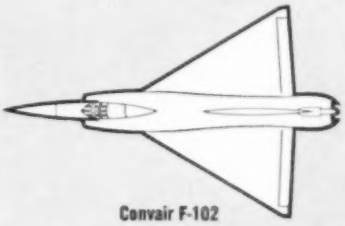
North American F-100


Boeing B-47

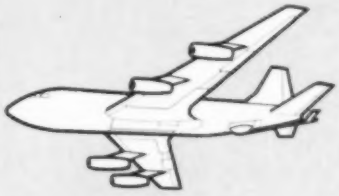
Convair B-36

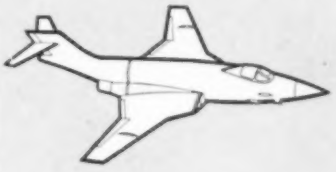

Boeing B-52

Douglas RB-66


Convair F-102

Northrop F-89


Boeing KC-135


McDonnell F-101

These American aircraft all carry ducting components by Solar

LEADING TURBINE-POWERED aircraft use Solar-built ducting in their pneumatic systems. Designers of these planes depend on Solar's unique facilities for complete systems or individual assemblies to meet the most stringent specifications.

With the trend to more intricate ducting systems and to higher pressures and temperatures, the flight safety requirements of these vital components becomes increasingly important. Solar is a completely integrated ducting source—all the way from design engineering through to comprehensive testing. Can Solar help you solve a ducting problem? Write Dept. C-50, Solar Aircraft Company, San Diego 12, California.

SOLAR

AIRCRAFT COMPANY

SOLAR

SAN DIEGO DES MOINES

Designers, developers and manufacturers of gas turbines—aircraft and missile components—bellows—controls—high temperature coatings—metal alloy products

LOCKHEED'S F-104A *Starfighter*, latest supersonic Air Force fighter, is only one of more than 40 turbine-powered aircraft currently equipped with products built by Hamilton Standard. Superior engineering, research, development, and experience stand behind Hamilton Standard's leadership in production for outstanding aircraft—jet or propeller driven.

WHEREVER MAN FLIES

HAMILTON STANDARD

Propellers • Starters • Air Conditioning Systems • Fuel Controls • Valves • Pumps

HAMILTON STANDARD, WINDSOR LOCKS, CONNECTICUT

JULY 30, 1956

AVIATION WEEK

VOL. 65, NO. 5

Editorial Offices

New York 36—330 W. 42nd St., Phone: LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phones: NAtional 8-3414, REpublic 7-6630
Los Angeles 17—1125 West Sixth St., Phone: MAdison 6-9351

PUBLISHER.....Robert W. Martin, Jr.
EDITOR.....Robert B. Hotz

MANAGING EDITOR.....Alpheus W. Jessup
ASST. MANAGING EDITOR (TECHNICAL)
David A. Anderton
WASHINGTON.....Cecil Brownlow
NEW YORK.William Gregory, James J. Dailey
LOS ANGELES.Irving Stone, Richard Sweeney
ENGINEERING.....Robert H. Cushman, Russell Hawkes
AVIONICS.....Philip J. Klass
CONGRESS.....Katherine Johnsen
MILITARY....Claude O. Witze, Evert Clark
TRANSPORT....Craig Lewis, Glenn Garrison, L. L. Doty
EQUIPMENT.....G. L. Christian
BUSINESS FLYING.....Erwin J. Bulban
ART EDITOR.....Lawrence J. Herb
ASST. ART EDITOR.....Robert G. Young
EDITORIAL PRODUCTION....Jerome E. Kelley
EDITORIAL ASSISTANTS
Bernie Lang, Betty Hein
LIBRARIAN.....Jeanne Rabstejnek

FOREIGN NEWS SERVICE

EDITOR.....John Wilhelm
LONDON..... William J. Coughlin
PARIS.....Robert E. Farrell
BONN.....Gerald W. Schroder
MEXICO CITY.....John H. Kearny
RIO DE JANEIRO.....Peter Weaver
TOKYO.....Dan Kurzman

DOMESTIC NEWS BUREAUS

ATLANTA 3.....801 Rhodes-Haverty Bldg.
CHICAGO 11.....520 No. Michigan Ave.
CLEVELAND 15.....1510 Hanna Bldg.
DETROIT 26.....856 Penobscot Bldg.
HOUSTON 25.....1303 Prudential Bldg.
LOS ANGELES 17.....1125 West Sixth St.
SAN FRANCISCO 4.....68 Post St.
WASHINGTON 4...1189 National Press Bldg.

SALES

ADVERTISING SALES MANAGER
E. P. Blanchard, Jr.
PROMOTION and RESEARCH MANAGER
W. H. Jack

ATLANTA.....R. H. Powell
BOSTON .....A. C. Boughton
CHICAGO and ST. LOUIS.....J. S. Costello, F. E. Bauman
CLEVELAND.....H. P. Johnson
DALLAS.....Gordon Jones, Douglas Billian
DETROIT.....C. A. Ransdell
LOS ANGELES..... .....C. F. McReynolds, D. T. Brennan
NEW YORK.....M. J. Storz
PHILADELPHIA....W. S. Hessey, J. D. Willis
SAN FRANCISCO.....William Woolston

BUSINESS

BUSINESS MANAGER.....J. G. Johnson
PRODUCTION MANAGER.....W. V. Cockren

RESEARCH AND MARKETING
Mary Whitney Fenton, Elinore Eisenson, Joan Read

Charges Hurled at British Air Industry 28
► Alleging greed, lethargy, incompetence in companies, former Gloster chief test pilot singles out Javelin for criticism.

Capital Orders 14 de Havilland Comets 40
► U. S. airline purchases medium-range British jet; passenger flights scheduled for January 1959.

USAF Goal: More Data, Fewer Instruments 48
► Part II of series on program of instrument panel redesign describes navigation, power systems.

MISSILE ENGINEERING
Djinn Copter Fires Missile 39

AERONAUTICAL ENGINEERING
KC-135 Cockpit, Flying Boom 31
Turbine Doubles H-21 Lift 35
French Mystere Aerobatic Team 36
Grumman TF-1 36
B-45 Takes J75 Aloft 47
Vertol Uses New Blade Adjustment. 71
C-130 Performance Data Revealed... 72
Navy Commissions Helicopter Carrier 77

AVIONICS
Greater Avionic Reliability Asked... 34
Device Stores Information 57
GE Develops Tunable Magnetron 57
Changes in Avionics Industry 58
New Avionic Products 58

EQUIPMENT
Three Mufflers for Jet Runups 62
Cartridge Use Expands 63
Light Seat Has Adjustable Legs 64
Self-Sealing Rivets 65
Boeing Produces New Starter 65
Cockpit Simulates 150,000 Ft. 66
Off the Line 66
New Aviation Products 74
Also on the Market 76

TRANSPORT
Congress Acts on Aviation Bills 31
CAB Warns of Collision Toll 32
ACC Plan for Critical Zones 33
British Would Finance Comet 41
Airline Stocks Look Better 41
Railroads React to Air Competition.. 42
Fate of Nonskeds Clouded 42
Airline Helps Brazilian Economy 43
Pacific Air Traffic Grows 45
CAB Orders 45
Shortlines 46

BUSINESS FLYING
Plane Decoration Volume Grows 87
Unicom Links Oil Rigs, Aircraft 90
Magnetometer for Small Aircraft 91
Private Lines 91

FINANCE
USAF Contracts 78
Navy Contracts 81
Army Contracts 83

MANAGEMENT
Probe Would Abolish OSI 30
Who's Where 25
Industry Observer 25
Washington Roundup 27

Calendar 4
Letters 102

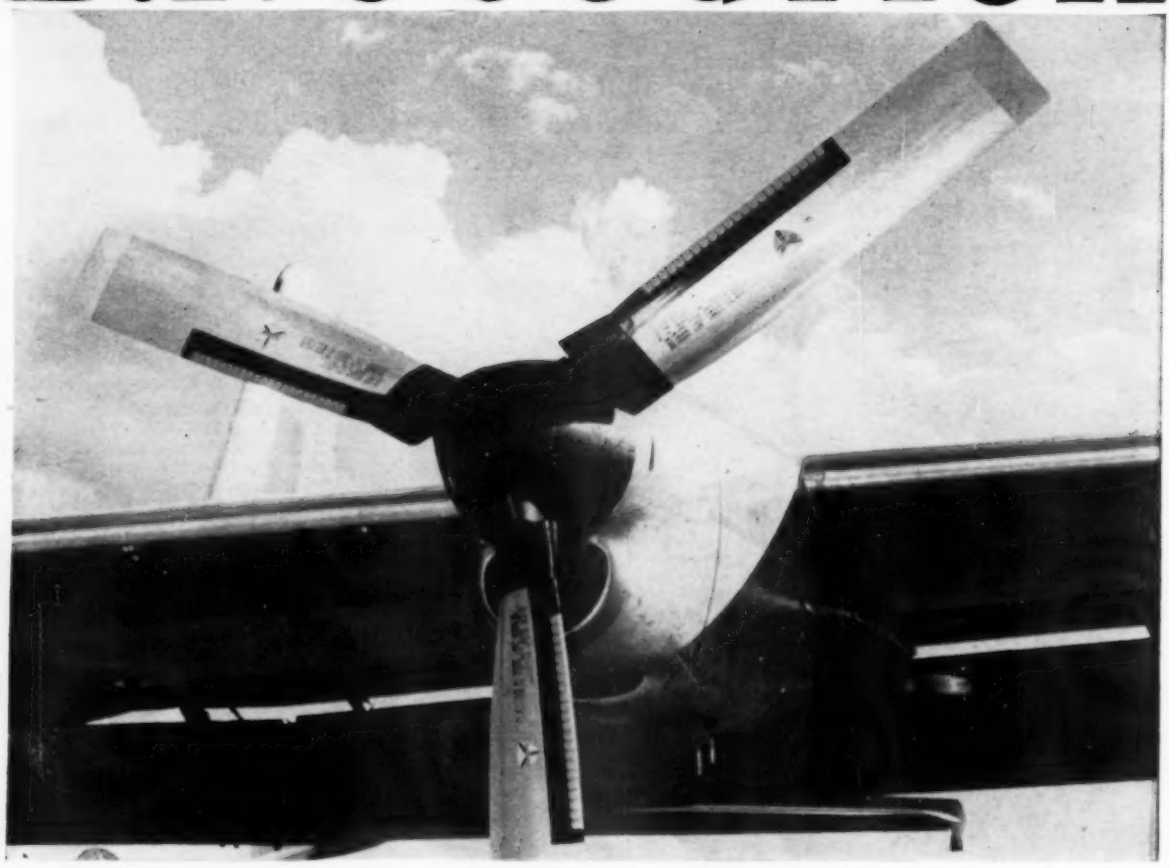
EDITORIAL
Keep an Eye on Aeroflot 23

COVER: Lockheed C-130s fly over Marietta, Ga. plant of Lockheed Aircraft. For latest performance data of Hercules see page 72.

65,978 copies of this issue printed

AVIATION WEEK • JULY 30, 1956 • Vol. 65, No. 5
Member ABP and ABC

B.F.Goodrich



Blades that save pilots from close shaves with ice

THERE'S no need to dread propeller ice when blades, cuffs and spinners have complete protection like the Lockheed C-130 Hercules shown above. B. F. Goodrich electrical De-Icers are designed to put the required amount of heat on these vital propeller parts.

Resistance wires are sandwiched between rubber plies to form the desired heat pattern—then vulcanized into flexible, lightweight units for cementing directly to metal surfaces.

B. F. Goodrich electrical propeller De-Icers fit skin-tight around tricky curves and corners—give added protection against eroding effects of rain, sand and dust.

If you are looking for one of the most efficient ways to provide spot heat—whether for ice protection or heat control—B. F. Goodrich electric De-Icers and heaters are the answer. Successful applications include antenna masts, wing and empennage leading edges, oil lines, oil cell heaters, air intakes and radar equipment.

Perhaps these examples suggest a possible solution to your own ice or temperature control problems. B. F. Goodrich engineers will be pleased to give you expert help. *Aviation Products Division, The B. F. Goodrich Company, Akron, Ohio.*

B.F.Goodrich

AVIATION PRODUCTS Tires, wheels, brakes • De-Icers • Inflatable seals • Fuel cells • Avtrim • Heated Rubber • Pressure Sealing Zippers • Rivnuts • Plastilock adhesives • Hose and rubber accessories

EDITORIAL

Keep an Eye on Aeroflot

Soviet military aviation has sprung a series of surprises on a too smug western world during the past three years. After a look at operations of Aeroflot, the Soviet's government-owned airline, and talking with some of its executives and aircraft designers in Moscow, we predict that the Russians will spring some new surprises in air transport on the West during the next five years.

Looking at Aeroflot operations today could be just as deceptive as watching the swarms of piston-engined Stormoviks, Yak fighters and Tu-4 copies of the Boeing B-29 in the post-war period up to 1950. When the MiG-15 appeared in Korean combat in 1951 it upset most of the western world's concepts about the state of the art of Soviet jet aviation. Similarly the appearance of the Badger twin jet medium bomber and the Bison four jet heavy bomber over Red Square in 1954 upset western concepts of the "essentially defensive" nature of the Red air force.

Today Aeroflot is essentially in the DC-3 era of air transport comparable to the U. S. airline operations of 1940, just before World War II plunged them into four-engine equipment and long-range operations. The Il-12 and Il-14 transports now operated in large numbers by Aeroflot are in the speed category of early vintage Convair-Liners but have about the same seating capacity of 21 to 24 passengers as U. S. built DC-3s. For reasons best known to the Russians, their DC-3 manufactured under World War II license seats only 15 passengers. With this outmoded equipment Aeroflot does a workhorse job over the vast domain of the U. S. S. R. and its political satellites.

But despite its current picture of an air transport era long since past in the western world, Aeroflot is already showing signs of spreading jet powered wings in the international airline field. There are signs that the Communist hierarchy has realized the vital necessity of swift air transport as an indispensible part of its new policy of melting the Iron Curtain and encouraging cultural, economic and political relations with the western world.

Even the international air traffic generated by exchanging soccer, boxing and track teams has severely taxed the airline facilities linking Moscow with the rest of the world. Increasing volume of business travel between Western Europe and the Orient has also outstripped Soviet airline capacity. Because of its strategic geographic position in the Eurasian heartland, the Soviet Union is a key crossroads for international airline routes.

There are signs that Aeroflot has felt the double stimulus of official prodding for modernization and expansion and official backing for the development of new facilities required. An extensive airport improvement program was included in the latest Five Year Plan. A whole new family of gas-turbine powered transports has been authorized with work on all of them well-advanced.

These include the now-familiar Tupolev Tu-104 twin jet transport which is now definitely established as a new design and by no means a civil adaptation of the Badger bomber. As nearly as can be determined from scattered bits of chronology made available by Russian sources the Tu-104 has been through a remarkably swift cycle from requirement decision to the threshold of airline service.

Decision to get into the jet transport business on a substantial scale was apparently made by Soviet leaders early in 1954. By June of 1955 the Tupolev design team had built their first flying article which was a pre-production article rather than a prototype. This is an interesting point because it is identical with the philosophy employed by the U. S. Air Force to cut the development-to-production cycle. It also explains why the next three Tu-104s appeared so quickly after the first plane flew.

The first Tu-104 made its initial flight in June 1955 only a few weeks before the National Aviation Day air show at Tushino, postponed until July 1955 because of bad weather. The Tu-104 was scheduled to begin regular Aeroflot service in June 1956, hardly more than two years after the original design decision was made. The only transport we know that can beat that cycle is the Douglas DC-7C which came at the end of a long development line. However, the Tu-104, like new jet transports under any flag, is having development troubles and at this writing is still not in regular Aeroflot service.

Coming along behind the Tu-104 are:

• **Tu-110 four jet transport.** This plane is billed by the Soviets as designed to carry 170 passengers in a double-decked fuselage. This is a much larger aircraft than a civil version of the four jet Bison could possibly be.

• **Antonov turboprop cargo transport.** Prototype of this plane, also scheduled for use as a military assault transport flew in the 1956 Tushino show (AW July 2, p. 26). It will fill the serious gap in Aeroflot's air freight capacity.

• **Ilyushin turboprop passenger transport.** Prototype of this machine has been completed at Aircraft Assembly Factory No. 45 adjoining Moscow's Central Airport. Powered by four turboprops this swept-wing transport is aimed at 70-80 passenger capacity.

• **Large turboprop transport** about which few details are known. The Soviets keep mentioning that this type is under development and specifically differentiate it from the Ilyushin design cited above.

This family of five gas-turbine powered transports will give Aeroflot a completely new look during the next five years. The airline, like all others jumping into the jet era, will be hard put to develop a suitable airport network, electronic navigation and traffic control system and adequate passenger handling facilities.

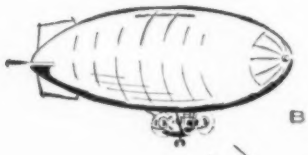
Aeroflot also has been nibbling on the fringes of ICAO and studying the fine print of all the IATA membership requirements and obligations. It should be no surprise when Aeroflot finally joins these two international organizations as it must be evident how much technical and economic knowledge they have already lost by abstaining from participation in these groups.

Keep an eye on Aeroflot! Don't be surprised if it emerges as a tough competitor in the international airline business during the next five years.

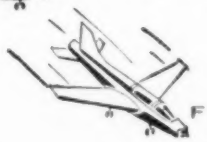
—Robert Hotz

all rely on CPT landing gear

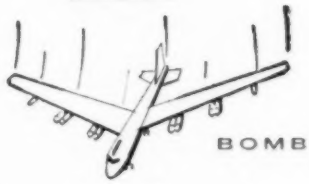
HELICOPTERS



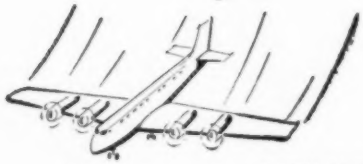
BLIMPS



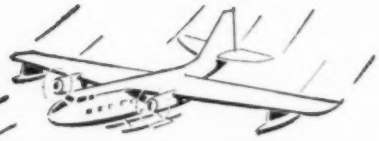
FIGHTERS



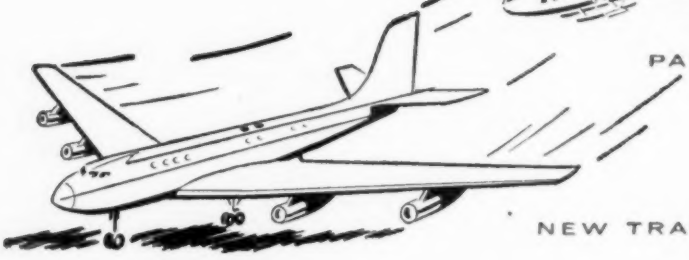
BOMBERS



TRANSPORTS



PANTOBASE FREIGHTERS



NEW TRANSCONTINENTAL JETS

Cleveland Pneumatic
Tool Company CLEVELAND 5, OHIO

Sales offices in Seattle, Los Angeles, Fort Worth-Dallas, and Levittown, L. I.

WHO'S WHERE

In the Front Office

Walter R. McLachlan, president, Orenda Engines, Ltd., Toronto, Ont., retaining his duties as general manager.

R. W. Ryan, executive vice president-director, Canadian Pacific Airlines; **R. B. Phillips,** vice-president-operations and **H. B. Renwick,** vice president-sales and traffic.

Walker G. Dollmeyer, vice president-operations, Solar Aircraft Co., San Diego, Calif., effective Aug. 1.

Joseph V. Dooley, assistant vice president-operations, American Airlines; **Samuel C. Dunlap,** vice president-cargo.

Allan S. Robertson, vice president-sales, Fenwal, Inc., Ashland, Miss.

Norman Warren, vice president-advertising-public relations, Lear, Inc., Santa Monica, Calif.

Capt. H. T. Dietrich, (USN, ret.), assistant to the president, Kaman Aircraft Corp., Bloomfield, Conn.

Arnold Johnson, senior vice president, Weber Aircraft Corp., Burbank, Calif.; **Fred Godfrey,** vice president-manufacturing.

Ernest R. Breech, board chairman, Aeronautronic Systems, Inc., subsidiary of Ford Motor Co., Glendale, Calif.

Honors and Elections

Col. Horace A. Hanes (USAF Air Research and Development Command), awarded the Mackey Trophy for 1955, for his record of 822.135 mph. in a North American F-100C Super Sabre on Aug. 25, 1955, taking the Thompson Trophy.

Charles B. Sheckells, Douglas Aircraft Co. standards engineer, elected national chairman, National Aircraft Standards Committee, Aircraft Industries Assn.

J. B. Connelly, vice president-general manager, Transport Division, Boeing Airplane Co., named chairman, Industry Advisory Committee, Flight Safety Foundation, Inc., New York, N. Y.

Dr. Charles S. (Casey) Jones, president, Academy of Aeronautics, LaGuardia Airport, N. Y., awarded the 1956 annual James H. McGraw Award.

Robert F. Wichser, Republic Aviation Corp. chief research engineer, named to a special panel to keep the Defense Department informed on titanium developments.

Changes

Kenith G. Strunk, administrative director of engineering, Breeze Corps., Inc., Union, N. J.

B. M. Brown, manager, Baltimore, Md. Divisions, Westinghouse Electric Corp., replacing **F. W. Godsey, Jr.,** resigned.

Hooker Stoughton, manager, aircraft fastener section, Closure Division, Scovill Manufacturing Co., Waterbury, Conn.

Joseph Swanson, assistant to chief engineer, Levinthal Electronic Products, Inc., Redwood City, Calif.

Ray Matlock, western sales engineering representative, Meletron Corp., Teaneck, N. J.

Charles D. Driskill, stations superintendent-Puerto Rico, Riddle Airlines.

INDUSTRY OBSERVER

► Douglas A3D-2, latest production version of the twin-jet Skywarrior, is undergoing flight-test trials at Edwards AFB. Also under test at Edwards is a modified version of the Douglas Skyhawk. The aircraft, designated the A4D-2, has been fitted with a powered tail control.

► Fairchild Blue Goose, long-range missile portion of one of Convair's B-58 weapon systems, is nearing the flight-test stage.

► Soviet air force has a definite preference for the probe-and-drogue type aerial refueling system. The Soviets have completed extensive development work on both flexible systems and the rigid flying boom type now used on most Boeing KC-97 tankers and scheduled for the KC-135 jet tanker. U. S. Navy and Tactical Air Command also prefer the probe-and-drogue system.

► Powerplant for Northrop's supersonic trainer will be below the 10,000-lb. thrust class but will have lower specific weight and fuel consumption than present powerplants in this class.

► Marcel Dassault's Etendard II and Etendard IV jet tactical-support fighters made their first flights last week. The Etendard II, powered by two Turbomeca Gabizo engines, is the new designation for the Mystere 22. Etendard IV, equipped with a Snecma Atar engine, was formerly named the Mystere 24. The Etendard VI, Dassault's third new tactical-support fighter, is scheduled to make its first flight before the end of the year. The aircraft, named the Mystere 26 before the recent name changes, is powered by a Bristol Orpheus.

► Army, through the Air Materiel Command, has awarded Sikorsky Aircraft a $10,032,500 contract for production of H-34A cargo helicopters.

► Sud-Est has designated its SE-3200 jet helicopter the "Super-Alouette." The aircraft, for which two prototypes are on order, will be powered by three Turbomeca engines and probably will carry between 25 and 30 passengers.

► Radioplane Co., Van Nuys, Calif., has received a $5,110,702 contract from the Air Materiel Command for OQ-19D target drones and launching equipment.

► Boeing Airplane Co. has received a $4.2 million USAF contract for construction of facilities for production of the Bomarc surface-to-air interceptor missile at Seattle.

► Italy's new light interceptor, the Sagittario II, has begun its flight-test program.

► An engineering study of automatic assembly techniques for guided missile electronic equipment will be conducted by Stavid Engineering, Inc., Plainfield, N. J., under a $166,823 contract from the New York Ordnance district.

► Ex-Cell-O Corp. has received a $1.5 million contract from the USAF for facilities for production of engine components for the General Electric J79.

► Pump and turbine laboratory will be constructed at the Hartford Research Center, Middletown, Conn., under a $1,757,888 contract awarded by the Army Corps of Engineers.

► Russia's Paris embassy has made repeated requests to visit the Sud-Est factory at Toulouse where the Caravelle jet airliner is in production. Thus far, the requests have been refused, although France apparently would have no objection to selling the aircraft to Iron Curtain countries if East-West trade restrictions are eased.

► American Machine & Foundry Corp. will provide for support facilities for Convair's Atlas intercontinental ballistic missile and the Douglas Thor intermediate-range ballistic missile.

NAPIER

announces that the

Eland

propeller turbine aero engine

has passed its official

150 hour

type test at 3,000 e.h.p.

NAPIER ELAND

Partners in Progress with The ENGLISH ELECTRIC Company, Ltd.

D. NAPIER AND SON LIMITED • LONDON W. 3. ENGLAND

Representatives: J. C. K. Shipp, Suite 909, Dupont Circle Building, 1346 Connecticut Avenue N.W., Washington 6, D.C. Tel: Dupont 7-2123

P. J. Waite, Marconi Aviation Dept., 970 McEachran Avenue, Montreal 8, Quebec. Tel: Victoria 3627

CIRC 512

WASHINGTON ROUNDUP

No Money for Talos

The Senate Armed Services Committee, angered by a Presidential rebuff, has returned to its adamant stand against authorizing $16.2 million for the construction of USAF facilities for the Talos interceptor missile.

Initially opposed to the authorization, the committee finally went along after its approval by the House. It stipulated, however, that, in view of the USAF-Army feud over the relative merits of the Talos and Nike, final Air Force plans for the missile would have to be cleared by the committee.

The President then vetoed the $2.1 billion military construction bill containing the authorization, protesting that the committee's stipulation represented an invasion of his executive powers.

Stung by the rebuttal, the committee has decided to cut out all funds for the Talos. That way there can be no invasion.

Action on Airways Plan

The Senate Appropriations Committee last week gave hasty approval to the $68 million requested by the President to telescope the Civil Aeronautics Administration's $250 million five-year Federal Airways Program into three years (AW July 23, p. 40). The prospect was that the House would unhesitatingly concur before the close of the congressional session. Spark behind such prompt action was the recent mid-air collision between United Air Lines and Trans World Airlines aircraft over Grand Canyon in which 128 persons were killed.

Of the $68 million, $14 million is for operation of the airways system and $54 million for 80 very high frequency omni-ranges, 13 long-range radar facilities for en route traffic control, 23 airport surveillance radar facilities and manual control of all airspace above 15,000 ft.

Alert But No Information

Biggest single lesson learned by the Pentagon from Operation Alert: First cog to bog down in an emergency is the Defense Department's public information system.

At the outset of the nuclear attack exercise, Defense Secretary Charles E. Wilson said Alert was "designed to give the people of our nation a better understanding of the problems that might exist in the event of an attack." The opposite was true. Newsmen found it virtually impossible to obtain reliable information about the operation from either Defense officials or their public relations spokesmen.

Top responsibility for the situation rests with Robert Tripp Ross, Assistant Secretary for Legislative and Public Affairs, who already is under fire from the Moss Committee (see page 30).

What Is ACC?

The question as to whether the Civil Aeronautics Board is relinquishing its quasi-judicial powers by participating in Air Coordinating Committee activities has been raised by the House Government Operations Subcommittee. Chairman Robert Mollohan (D.-W. Va.) said the CAB would be "legally if not morally bound" to accept ACC decisions whenever a CAB representative cast an affirmative vote with the committee. CAB Chairman James Durfee denied the charge, terming the ACC an "effective clearing house" to recommend aviation policy matters. The CAB, he said, is not bound by these recommendations.

Burke Fails Again

Members of the Virginia and Maryland congressional delegations apparently have succeeded once again in killing off the proposal for construction of a new airport at Burke, Va., to help service increasing capital traffic.

After listening to the protests of the two delegations, the Senate Appropriations Committee declined to vote the $34 million requested by the President to launch the project. Instead, the Committee recommended that a subcommittee of five be appointed "to look into this matter and report back not later than Jan. 15, 1957."

Every time the Burke proposal has been made over the past five years Virginia and Maryland representatives and senators have banded together to defeat it.

The Virginia delegation is simply opposed to having an airport at Burke. Despite a survey which showed that residents in the area decisively favor the airport, Rep. Joel Broyhill (D.-Va.), who represents the Burke district, told the Senate Appropriations Committee: "The Federal Government has already poured enough money into my district. I don't want any more for this airport."

The Maryland delegation wants the over-flow traffic from Washington National Airport channeled into Baltimore's Friendship Airport.

Airpower Report Delayed

The Senate Airpower Investigating Subcommittee, which launched its investigation to assess the relative airpower positions of the U. S. and Russia, probably will not issue a report on its findings until after the November elections. Members of the subcommittee, headed by Sen. Stuart Symington (D.-Mo.), say they feel that this would be the best way to keep politics out of the report.

The subcommittee concluded its investigation without a concrete decision in the dispute between Symington and Defense Secretary Charles Wilson. The question: Was Wilson's reassuring testimony (AW July 9, p. 29) factually inconsistent with that of military officers and Allen Dulles Central Intelligence Agency head? At the final open session Symington said it was.

Wilson later wrote the Senator: "While, in my opinion, my testimony and theirs is in general accord as to facts, it certainly does not surprise me that differences of opinion have developed. In fact, I consider it normal for divergent opinions to exist whenever individuals express their honest views on complicated and important matters and have different degrees of responsibility."

Airframe Executive Pay Hit

Rep. Edward Hebert (D.-La.), chairman of the House Armed Services Investigating Subcommittee which recently completed a study of the major airframe firms (AW July 23, p. 28), later reported he was "stunned" at the executive salaries paid by some of the smaller firms.

"The President of the U. S. and his Cabinet and the White House staff do not have an executive payroll the size of a few of these smaller companies," Hebert declared, "and I think those companies had better take a good look at themselves or the house will fall down."

—Washington staff

JAVELIN MK.1s belonging to No. 46 Squadron RAF in wheels-down formation. No. 46 Squadron will be only unit to get Mk. 1s, which are still under a number of flight restrictions on speed and aerobatics. Other squadrons will be assigned Mk. 2s or 4s.

Charges Hurled at British Air Industry

Alleging greed, lethargy, incompetence in companies, former Gloster test pilot criticizes Javelin.

By William Coughlin

London—Britain's aircraft industry was charged last week with greed, inefficiency, incompetence and lethargy by the former chief test pilot of Gloster Aircraft Co.

The attack is contained in a newly published book by Squadron Leader W. A. Waterton, who was discharged by Gloster in 1954 after seven years with the firm. Title of the book:

"The Quick and the Dead."

It is the most severe criticism of the British aircraft industry ever made public, attacking not only the industry in general but Gloster Aircraft and its development of the delta-winged Javelin interceptor in particular.

Tested Javelin

Waterton was test pilot of the Javelin during much of its early development. The aircraft, which first flew in November, 1951, went into squadron service with the Royal Air Force this year after a long series of delays due to development difficulties. The subsonic Javelin still is flown under a number of flight restrictions on both speed and aerobatic maneuvers.

Waterton charges in his book that Gloster designers and technicians ignored his recommendations for changes in the Javelin and produced "endless excuses" as to why alterations could not be made—"excuses that were always a defense of the design office and the works."

"I was anxious to correct any flaws—or as many as could be spotted—before the Javelin went into production," Waterton says. "I might have saved myself the trouble, for even when the plane was little more than a design it became obvious that my complaints were a waste of breath."

Gloster Reply

Gloster has replied that Waterton's allegations are not substantiated by the facts.

Waterton charges that the British aircraft industry:

- **Lacks the incentive** of real private enterprise and is virtually nationalized in all but name and distribution of profits.
- **Operates "back alley garages"** in comparison with its American counterpart and lacks the stretch presses, milling machines, shapers, drop hammers and even small power tools needed to produce modern aircraft.
- **Has failed** to plow back the huge profits of the past 10 years into equipment and facilities, is still producing airplanes by methods almost identical with those of 15-20 years ago and has fallen far behind in aerodynamics.
- **Pays too low** wages and is plagued with employes "who haven't done a decent day's work in years."

"They (the companies) revolt at paying two competent experts 50 pounds each per week yet cheerfully pay 10 incompetents 15-20 pounds to muddle along and accomplish nothing," Waterton says.

'Tight and Smug'

He charges that British aircraft firms are sitting "tight and smug" on the basis of guaranteed profits which they will not plow back due to fear that the industry will be nationalized if a Labor government returns to power. Instead, as quickly as possible, they are "getting all they can."

Waterton's charges drew front page headlines in British newspapers and Gloster has issued a statement terming the book "a profusion of petty and malicious detail."

Eric Greenwood, who preceded Waterton as chief test pilot at Gloster and who now is publicity director for the firm, has issued a personal statement condemning Waterton for "harrowing self dramatization, sensational slanders,

half truths and flaunted betrayals.

"It may be that the British aircraft industry and its airplanes to which many of us have been proud to devote our lives—needs vigorous and honest critics," Greenwood says. "Squadron Leader Waterton, although he has chosen the role of critic, has failed irrevocably to inspire our respect. He used his knowledge of aviation affairs, gained in positions of highest trust, to pursue his grudges in the press for more than two years.

"Until today we have felt it best to keep silent, to wash the mud off as best we could, and certainly not to stoop to throw it back."

Javelin Criticism

Waterton makes these charges against the Javelin:

- **Controls of first Javelin** prototype were so "hopeless" that they horrified him. He asserts that they were virtually immovable at more than half speed even with two hands.
- **Controls of second** Javelin were worse than those of the first prototype "especially the elevators which had extra weights on their noses in the hope of preventing a recurrence of the plane's flutter."
- **Initial Javelin wing** fell down badly on high useable Mach number and did not produce the required turning ability at high altitude. (It was replaced with the present cranked wing with reduced leading edge sweep.)
- **Aircraft carried** an inadequate fuel supply for its mission.
- **Cockpit visibility** remained poor despite his complaints about inadequate vision.
- **Javelin prototype** shook so violently on its first flight that he could not exceed 150 mph.
- **First production aircraft** was restricted to under 200 mph. on its first flight because its ailerons were understressed and it was immediately grounded after the flight for aileron modifications. He said he was informed of the restriction by a designer who called him to the telephone as he was on his way to the ramp to make the flight.
- **Javelin exhibited** dangerous tendencies toward reversing longitudinal control near the stall, tightening into the turn, and pitching strongly nosecup when flaps were extended.

Waterton says the aircraft also was plagued with a host of other control, stability and engineering problems. Speaking of an early flying display he says, "I did not loop either then, or at the two Farnborough shows at which I flew the Javelin, for I should never have had the strength to pull it out of a steep dive."

He charges that the faults he pointed out were ignored for reasons of politics, production and business, and asserts that as a test pilot he was little more than a "stooge" for the sales, publicity, commercial and design departments. Waterton says he was once told by senior RAF officers at the Ministry of Supply not to be too critical of the Javelin because they wanted it in service in a hurry.

In its rebuttal to Waterton's charges, Gloster says "in view of the damage which could be done to the national as well as the company's interest by Squadron Leader Waterton's reference to the Javelin, it must be made clear that the aircraft with which he was familiar were vastly different from the aircraft now being delivered for RAF service. Practically all the test flying of direct value to the aircraft now in service and most of their modifications have been carried out since his dismissal."

The company says Waterton was dismissed because he showed a marked disinclination to continue the necessary research flight testing of the Javelin.

"It was decided that this testing could be speeded up and conducted more thoroughly under a new chief test pilot," the firm says. "The wisdom of this decision has since been amply proved."

Waterton says in his book that when USAF Colonels Richard Johnson and Pete Everest flew the second Javelin prototype they confirmed his reports of its deficiencies.

'Coincided Opinions'

"It was a tremendous satisfaction to me that their impressions of the plane and its defects coincided exactly with my own," Waterton says. "The faces of the designers were a study as they listened to the Americans' criticisms. It

Farnborough Safety Questioned

The pilot who flew the Gloster Javelin in two SBAC displays says "it is a miracle that there are not mass disasters at Farnborough every year." Squadron Leader Waterton charges in his book that the rivalry between British companies forces pilots to go far beyond safety limits in demonstrating aircraft and is turning Farnborough into a "Roman holiday."

He revealed a near disaster at Farnborough in 1947 when, flying a Gloster Meteor, he misjudged a low level loop and almost plowed into the crowd. This is his account of the episode:

"Reefing up from a screeching dive, I shot upwards and over the top of the loop, not at 150 mph., but at 200. Added to that I did not pull back on the stick hard enough initially and was doing around 300 while still partially inverted—and accelerating rapidly as I screamed nose down towards the ground only a couple of thousand feet below.

"I could feel the seven tons of Meteor heaving and shuddering under me, partially stalled.

"Then I could see clearly again: the railway line, a helicopter, rows of parked cars, the vast crowd with heads instinctively ducked. As they rushed towards me I thought: this is it.

"Numb with fear, I held on, pushed out a bit of flap to get more lift—and waited for it. But the Meteor responded. Her downward mush was arrested and she leveled out. I climbed again, badly frightened. . . .

"I learned later that I skimmed the ground at about 10 ft., shaking the parked helicopter and half hidden by the dust cloud I raised."

William A. Waterton is aviation correspondent for the London Daily Express. Waterton joined Gloster Aircraft as chief test pilot in 1946 and flew experimental jet prototypes and production aircraft. He did all of the initial flight testing of the Javelin delta-winged all-weather fighter and the Canadian Avro CF-100 all-weather fighter.

He began his flying career in the Royal Air Force flying Hurricanes to cover the Dunkirk evacuation in 1940. He also served in the Transatlantic Ferry Command, the Spitfire Mark VII High Altitude Squadron, and Fighter Command Weather Flight. In comparative trials for Fighter Command he flew almost every type of American, German, Italian and British fighter. He was a member of the RAF High Speed Flight that brought the world speed record to Britain in the late forties with the Gloster Meteor. Waterton has also written for Aviation Week (AW June 20, 27, and July 11, 1955).

was obvious that they had not believed a word I had written in my reports, but here were two impartial airmen repeating virtually everything I had said. Yet incredibly when the Americans left, their complaints were airily dismissed for the most part and things continued as before."

The former test pilot comments on his dramatic crash landing of the Javelin prototype after its elevators came off in flight—that the Gloster staff would have been happier if he had bailed out without bringing back the aircraft and its recording instruments.

"Certain boffins and designers never quite forgave me for bringing back the bent plane as conclusive evidence," he writes.

Gloster comments, "We feel everybody will regret Squadron Leader Waterton's deplorable suggestion that we wished to have the aircraft's records destroyed in his crash landing of the first prototype Javelin."

Waterton was awarded the George Cross for saving the only Javelin prototype then in existence.

In one of his most serious charges, Waterton alleges that failure to heed his recommendations led to the death of his assistant, Peter Lawrence, in the crash of a Javelin prototype. Lawrence was killed while ejecting from a stalled aircraft that "dropped almost vertically like a brick at more than a mile a minute with very little forward speed."

"As a result of the accident," Waterton says, "the firm altered the flaps. It was little consolation to me that it took the death of my Number One to effect modifications that my talking and reporting had been unable to achieve since the airplane's earliest flights."

Gloster says Waterton's account of the episode is "a distressing distortion of the recorded facts." The firm says the later modification based on Waterton's suggestions had nothing whatever to do with the cause of Lawrence's accident and would not have prevented it.

Terming many of Waterton's statements "untrue or ridiculous" Gloster states:

"We are confident that the many thousands of pilots of the RAF and foreign air forces who have flown our aircraft over the past 40 years will be able to assess the true value of Squadron Leader Waterton's insinuations that we have conspired among ourselves and with government departments to foist unsatisfactory or dangerous machines upon them."

Moss Probe Would Abolish OSI, Says Ross 'Confused' in His Job

By Katherine Johnsen

Washington—The House Government Operations Committee last week denounced the information policies and practices of the Department of Defense as "the most restrictive and . . . most confused" within the government.

In an interim report issued after a study of government information practices, the committee also urged the abolishment of the Commerce Department's Office of Strategic Information which, it said, was "unable to justify" its existence. The office was established in November, 1954, to control nonsecurity information.

Robert T. Ross, Assistant Secretary of Defense for Legislative and Public Affairs, was singled out for specific criticism in the report.

Pointing to Ross' testimony that his office is "the sole agency" for the release of defense information (AW July 16, p. 25), the committee commented: "Actually, his office has little more than the authority to rubber stamp information the various services have decided to release. He admitted he has no authority to release information the Army, Navy or Air Force has decided to withhold; and in many cases his office never learns of such negative decisions.

"Mr. Ross' claims of authority, his later denial of such authority, and his even later reassertions left the committee as confused about the functions of his office as Mr. Ross himself apparently is."

The study by the subcommittee, which is headed by Rep. John Moss (D.-Calif.), will be resumed this fall with particular emphasis upon Defense Department policies.

OSI Denounced

Regarding the Office of Strategic Information, the committee said the agency has "been unable to justify (its) existence . . . either for the purpose of restricting unclassified information from within the government or controlling unclassified information from outside the government."

The committee pointed out that the office of Assistant Secretary of Defense for Legislative and Public Affairs was authorized in 1948 to prevent interservice rivalries from breaking into the public prints, and then noted:

"That it has failed in this primary mission is amply proven by the recent public outbreak of the so-called propaganda warfare between the services."

The committee also said that Defense Secretary Charles Wilson's 1955 directive requiring that defense information be "constructive," "again designed largely to still service rivalries" has similarly failed to fulfill its purpose.

"At the same time, this order has been used to deny to the press and the public various kinds of information that have nothing to do with national military security."

'Scared' of Press

On military information personnel, the committee observed that "they are 'scared to death' of the press and prefer to avoid all contact with reporters lest they say something that may end up as a black mark in their records, permanently retarding their military careers."

Public information service in any of the three military services, the committee said, is "a dead-end street, generally leading to retirement long before flag officer status is reached."

"Except on those rare occasions where they receive the strong personal backing of the heads of their particular branch of the military establishment, officers who do find themselves in public information posts also find themselves continually stymied: they have no authority to free information that others, far removed from the press and from the public's desire for information, deem it necessary to withhold."

The report protested that the Department of Defense and the three services are classifying documents at such a fast clip, "that the Pentagon may some day become no more than a huge storage bin protected by triple-combination safes and a few security guards.

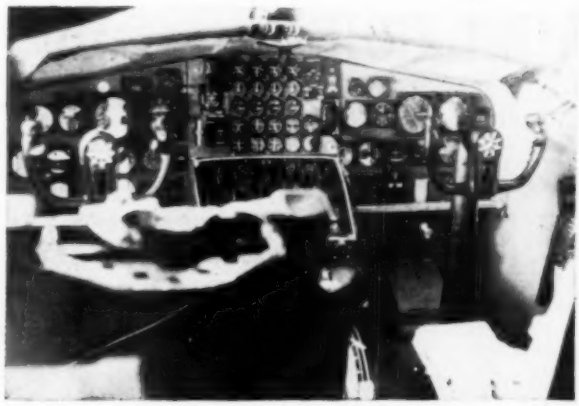
"Millions of documents each year are being added to the Defense Department's classified files, and only a small fraction are being declassified."

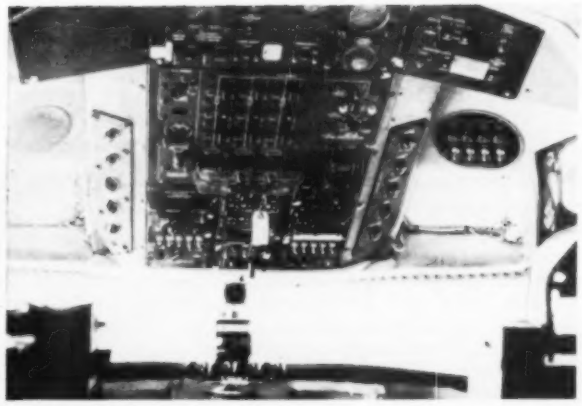
The committee added that the Presidential order stipulating that classified documents bear a date or event for subsequent declassification "is being almost totally ignored. Unless some operative system of declassification is developed in the near future, we may find ourselves completely walled off from our past historical achievements as well as from future progress in basic science."

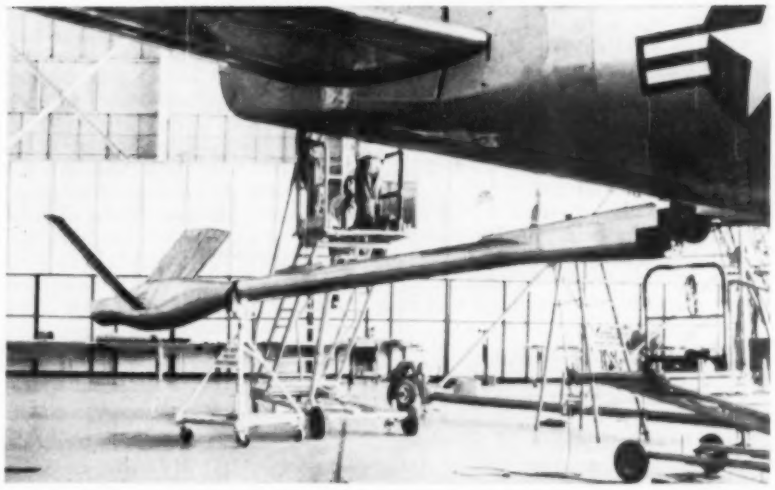
The committee also urged that experienced scientists be attached to every major U. S. Embassy to report on foreign scientific developments and to facilitate exchange of scientific information. It added:

"Except where matters of military security are involved, the reports of these attaches should be given the widest dissemination so that American scientists can be kept abreast of world developments."

Viewing the over-all picture on government information, the committee







KC-135 Instrument, Flying Boom Detail

Instrument panel (top left) of KC-135A which made its debut recently at Boeing's Renton plant has conventional layout. Engine gages in center of panel overflow into co-pilot's flight group. Outlined in white below the engine gages is panel containing fuel instruments and fuel management controls. Radio and electrical system controls (top right) are located overhead. Flying Boom (right) installed on KC-135 is modified version of that used on KC-97. Rudder-vators have been enlarged. Slots for travel of variable incidence stabilizer are visible.

concluded that "slowly, almost imperceptibly, a paper curtain has descended over the Federal Government. Behind this curtain lies an attitude novel to democratic government—an attitude which says that we, the officials, not you, the people, will determine how much you are to be told about your own government."

Congress Acts on Aviation Measures

Washington—Congress, in the rush to wind up its session, has acted on these aviation measures:

• **Alaska-Hawaii Lines.** Action was completed on legislation directing the Civil Aeronautics Board to give permanent certificates to intra-Alaska and intra-Hawaii airlines. The measure has been sent to the White House. A Senate-approved bill authorizing permanent certificates for U. S.-Alaska carriers was blocked by the House Commerce Committee.

• **Ministers' Travel Cost.** Legislation permitting airlines to grant free or reduced travel rates to ministers of religion on a "space available" basis has been sent to President Eisenhower.

• **Travel Tax.** Legislation removing the 10% tax on airline travel to the Caribbean, Central America, Mexico, Hawaii and Alaska, as of Oct. 1, also has been sent to the President. Only points 225 miles or more outside U. S. borders would be exempted. Foreign travel to Europe and other points on the globe already is exempted as an aid to U. S. carriers in competing with foreign lines.

• **Defense Secretaries.** Legislation authorizing each of the military services to appoint an additional assistant secretary was passed by the House but killed by the Senate Armed Services Committee.

• **Alcohol.** The House passed a measure banning alcoholic beverages on airline flights, but the prospect for Senate approval was dim.

• **Prototype Testing.** Legislation authorizing $12.5 million for the testing of new types of commercial aircraft by the Civil Aeronautics Administration was passed by the Senate and approved by the House Commerce Committee, with the likelihood that the House also would approve it. The measure revives legislation which was enacted in September, 1950, and expired in September, 1955. The new measure would give CAA five more years in which to request funds for prototype testing.

• **Re-Equipment Financing.** Legislation permitting subsidized air carriers to set aside earnings from the sale of equipment for re-investment in new equipment—without having the earnings deducted from their subsidy allocations—was passed by the Senate by a wide margin and approved by the House Commerce Committee. It ran into the determined opposition of Rep. John Heselton (R.-Mass.) on the House floor, however, putting its enactment in doubt.

• **Foreign Agreements.** Senate Commerce Committee approved legislation that would restrict the President's authority over international route cases and require airline industry participation in the negotiations of bilateral air agreements with foreign countries. Under the measure, the CAB decision on territorial route cases would be final. On foreign route cases, the President's power to over-ride the Board would be limited to "national defense" and "foreign policy" aspects.

If passed, it faces a possible Presidential veto.

CAB Warns of Potential Collision Toll

By L. L. Doty

Washington—As its investigators probed the worst mid-air collision in the history of U. S. Airlines, the Civil Aeronautics Board last week issued a detailed analysis of such accidents over the last eight years. Its conclusion: the "potential fatality toll" is rising steadily.

In its review, the CAB reported that 226 persons lost their lives in a total of 127 collisions between 1948 and 1955. Another 128 persons were killed in the mid-air collision of United and Trans-World Airlines' airliners over Grand Canyon on June 30.

The report, issued as a warning to pilots and traffic controllers, pointed out that 1955 was the worst year for air collisions since 1948, with a 31% increase over 1954. There were 21 in 1955, 16 in 1954. In 1948, there were 30.

Failure to observe other aircraft was described as the chief cause of the collisions. Carelessness accounted for 40 of the total, misjudged distance for another 17. Other facts brought out in the report:

Danger Points

- **Visual Flight Rule** conditions prevailed in 117 of the total collisions during the eight-year period. All but three of the collisions took place during daylight hours.
- **Most collisions occurred** while aircraft were in a terrific pattern or while making a landing.
- **Collisions are most likely** to occur over airports at altitudes of between 1,000 and 1,500 ft.

Of the 127 accidents, 60 brought about one or more fatalities. A total of 119 aircraft were destroyed, another 98 received substantial damage. There was only minor damage in 33 incidents.

A total of 122 private pilots were involved in the collisions. Commercial ratings were held by 60 of the pilots, 19 were qualified with air transport ratings, 28 were students and 19 were military pilots.

There were two cases in which the pilots possessed no license.

Visibility was in excess of three miles in 123 of the accidents, but sun glare was considered a factor in 10 of the collisions. Several instances were reported where crews failed to exercise normal caution and alertness in heavy traffic areas.

In one collision between a Cessna 140 and a Lockheed 749, the Cessna pilot had an unobstructed view. The pilot of the Lockheed could have seen the Cessna by slightly shifting in his seat.

Cause of this collision which resulted in the death of the Cessna pilot and passenger was attributed to lack of caution.

The report included a study of the type, configuration and coloring of the airplanes involved. But according to Ben W. Ashmead, of the CAB's Bureau of Safety Investigation, collisions can seldom be charged to these factors.

There are exceptions, however, a collision in 1953 at Belmar, N. J., was caused by the failure of a pilot to see an aircraft landing below him because of the plane's white coloring which blended with the snow-covered ground.

In 22 accidents reported, some type of clearance had been issued. Twenty-six collisions were in control areas, 16 in control zones under the direction of a control tower. A total of 61 of the aircraft were equipped with two-way radio, but only 25 were following a flight plan at the time of the collision.

Airline Collisions

Ninety-six of the accidents involved private aircraft only. There were 16 collisions between private and military airplanes. Air carriers collided with private aircraft in 11 incidents and two mid-air accidents involving military and transport airplanes were reported.

Two collisions between airliners occurred during the eight-year period for an all-time total of four collisions in this category.

Of the 11 mid-air collisions between an airliner and private aircraft, only one was fatal to the occupants of both aircraft. In 1955, over Covington, Ky., an executive DC-3 entered the Cincinnati traffic pattern without clearance or position report and collided with a TWA Martin 202A. There were 17 fatalities.

In one accident, the collision between an Eastern Airlines DC-4 and a P-38 fighter over Washington in 1949, all the fatalities were aboard the airliner.

Of the remaining collisions in this group, two were non-fatal and seven caused injury or death to the occupants of the private aircraft.

One of the two collisions between airlines involved an American Airlines Convair 240 and a United Airlines Convair 340. The accident occurred in 1953 at 11,000 feet over Michigan City, Ind.

Both airplanes landed without incident and there were no injuries to passengers or crew of either flight.

The other collision in the air-carrier category took place in 1951 over Oakland, Calif. Two DC-4s, both operated by non-scheduled airlines, collided during simulated (hooded) instrument approaches to the Oakland range. The two aircraft were observed on a converging course at the same altitude and no evasive action was taken by either crew. One of the DC-4s landed safely, but the other crashed on a highway.

Buzzing Takes Toll

Among the accidents caused by carelessness, buzzing took its toll. In one instance, a Navy pilot buzzing a small airplane pulled into a climbing turn and collided with a DC-3 cruising at level flight near Chesterfield, N. J. in 1949. The occupants of both aircraft were fatally injured.

Most of the accidents charged to misjudged distance took place during landing and takeoff. In one instance, however, two planes collided in mid-air while motion pictures were being taken of one airplane from the other. A close formation flight of three Aeroncas ended in a two-way collision in 1955 near Louisville, Ky.

An outstanding example of an accident caused by preoccupation in the cockpit occurred in 1955 near Hastings, Minn. Two Pipers collided when one pilot was busy computing ETA on his map and the other was engrossed in recording his time.

Good Construction Helps

Approximately 23% of the accidents occurred directly over the airport. Nine collisions happened at altitudes of less than 10 feet. There were 18 collisions between 1,000 and 1,500-ft. One accident was recorded at 11,000 feet and another at 9,500 feet.

While pilot skill was responsible for

AFA Convention

New Orleans—USAF's top experts on guided missiles, manpower, logistics and industry problems will participate in the tenth annual convention of the Air Force Association here between Aug. 1-Aug. 5. Both Air Force Secretary Donald A. Quarles and Gen. Nathan F. Twining, USAF chief of staff, will make major addresses.

A conference on guided missiles will be conducted by T. F. Walkowicz, AFA director, with presentations by representatives of USAF headquarters and the Air Research & Development Command. Air Materiel Command will discuss combat logistics at a second meeting.

The first major public appearance of Edward P. Curtis, special assistant to the President for aviation planning, will be made when he addresses AFA's industry luncheon on Aug. 2.

most safe landings following collisions, airplane construction was a major factor in preventing even more tragedies. An Aeronca landed safety in Wyandotte, Mich. with its right gear slashed off and the engine mounts broken. Although the engine was separated from a Cessna in a collision, a student pilot maintained control of the aircraft and landed safely at Harrison, N. Y.

Speed Limits, Two-Way Radios Urged by ACC in Critical Zones

Washington—Flight restrictions that would impose speed limits and require two-way radio equipment on all aircraft operating in high-density traffic areas are being urged by the Air Coordinating Committee as a result of a year-long survey which ends tomorrow.

The study was conducted by the Air Traffic Control and Navigation Panel of the ACC in the Washington High Density Air Traffic Zone (HDATZ) in order to bring about safe and more-efficient movement of traffic.

In its "final action" report, the ACC proposed a continuance of the Washington trial on a permanent basis. The agency also recommended that the Administrator of Civil Aeronautics establish rules "at the earliest possible moment" that would:

- **Designate** areas in addition to Washington areas as high-density zones.
- **Set a speed limit** for all aircraft operating in these zones.
- **Establish communications** requirements that would include "at least" two-way radio contact with control towers.
- **Prohibit VFR flights** in the high density zones when visibility is below certain minimums.

Washington Plan

A speed limit was set at 180 mph. in the Washington HDATZ during the one year trial period. VFR flights were prohibited when visibility was less than one mile and all aircraft were required to maintain two-way radio contact with the control tower.

A special task force was created for the purpose of monitoring the experiment at the three airports included in the Washington zone, National Airport, Bolling Field and Anacostia Air Base. The project was designated Special Working Group 8. Commercial, military and private operations were covered in the study.

The ACC report concluded that the tests demonstrated the value of the restrictions and urged that the program be expanded. It has recommended that the CAA take immediate action on its various proposals in order to "avoid confusion that might result from discontinuous procedures at Washington."

The agency also called for positive control of all traffic regardless of weather, although it admitted that "limitations of the existing air-traffic-control system would impose serious restrictions" on traffic flow.

During the trial, several pilots reported "near-misses." The ACC commented that "this came with no surprise for it was not expected that rules which did not provide positive separation of traffic by air-traffic control could eliminate the total near-miss problem."

Least controversial of all HDATZ rules was that dealing with the speed limit. While all pilots did not always abide by the restriction, most agreed it offered a better opportunity to observe and avoid other traffic. Out of 384 pilots questioned, 311 indicated they could comply with the speed limit with no trouble.

Pilot Response

Some pilots found it difficult to maintain the speed limit during descent. One pilot said the restriction "hampers the movement of traffic and penalizes the faster aircraft." Another wanted the restriction "to be law all over the country."

There was little disagreement over the need for two-way communications between aircraft and the Anacostia, Bolling and Washington National control towers. Slight controversy arose over when communications should be established. One member of the monitoring group said "pilots do not report

French Team Flies Mysteres

Aerobatic team of the French air force flies Dassault Mystere IV transonic fighters. Formation is a standard exhibition team box although the angle of the photograph makes it look more like two two-plane echelons.

until they reach the HDATZ boundary, thereby creating a hazard" because they are in the traffic pattern before being slotted into position.

Another pilot was criticized for calling in 30 miles from the zone.

The ACC reported that poor voice technique was responsible for some communications difficulties. In other cases, it said, inferior quality of receiving and transmitting equipment caused some disorder. Apparent lack of understanding of the elementary principles of radio operation was another complaint.

The majority recognized that radio interception of traffic information is no "fool-proof" procedure, but most felt any traffic data was much better than none.

Communications Saturation

There were a number of cases reported of communications saturation due to frequency congestion. A few reports were filed on tower radio malfunction because of interference from police radio frequencies. One frequency was periodically congested by radio calls to airports outside the Washington high-density area.

The visibility restriction was the most controversial of all HDATZ rules. Opponents termed it unnecessary because of its minor effect. Proponents called it a definite safety factor and many felt that the one-mile requirement is too low and should be made three miles if not five miles.

The ACC report said the minimum-visibility regulation offers Washington traffic controllers little relief because "visibility less than one mile" is seldom encountered.

One pilot reported, however, that "for once I felt that I wasn't going to overtake someone or be overtaken" because of the minimum visibility ruling. Numerous instances were cited involving the close proximity of aircraft because of restricted visibility due to smog or haze.

Visibility Problems

One observer commented that "a rule allowing tower controllers to suspend VFR during heavy traffic in borderline weather conditions would do more to create real safety in the HDATZ than the other rules put together."

Another monitor's report said: "At this writing, the visibility is 15 miles. The controller just had difficulty in exchanging traffic since he could not relocate a DC-4, eight miles south of the field, lost to view in haze. This sort of thing becomes very distressing when the visibility is only three miles . . . and is a compromise with safety when the controller is not within his rights to restrict VFR operation."

Greater Avionic Reliability Asked

Washington—The Defense Department, in an effort to obtain improved reliability and faster development of military electronics equipment, has issued a directive ordering that new systems be proved before being ordered into mass production.

The industry viewpoint as it studied the new order last week centered around two unknown factors that probably will determine its success:

- **How Army,** Navy and Air Force will fix procedures for testing of pilot models. The armed forces have 90 days to establish these practices.
- **Control exercised over** production funds by Frank D. Newbury, Assistant Secretary of Defense for Applications Engineering. While the directive gives the armed forces the right to deviate from a procedure in cases of extreme urgency, Newbury always must be notified of the deviation. His office must approve obligation of production funds.

Pilot Model Testing

Industry representatives pointed out that the pilot model testing requirement will result in at least some cases in a substantial lag between its delivery and final ordering of the equipment.

The new directive (3222.1) is the result of common military complaints about poor reliability. This factor is of increasing importance in modern combat aircraft and guided missiles. The Defense Department said in part:

"Because a significant cause of unreliability of electronic equipment has been the initiation of quantity production before product design is matured, the procedure is intended to assure adequate design development and tests prior to the equipment's release to production.

"Of particular significance is the requirement for pilot production of newly developed equipment and systems to verify the producibility of the design, to supply enough models to permit a statistically sound determination of systems reliability and to provide the opportunity to correct design deficiencies before quantity production for service use is commenced."

Spearheading the Defense Department drive for better protection against failures and costly modifications was J. M. Bridges, director of electronics in Newbury's office (AW Mar. 12, p. 249). His studies included work on Tacan and the AN ARC-21 transceiver, two cases where major programs were rushed through only to result in drawn-out programs to "debug" the equipment.

This has resulted from the military necessity to "buy the old equipment or gamble on the new" and where the latter choice was made, costly correction programs have been forced on the contractor and his customer.

The new procedures to qualify electronic equipment call for both technical and functional evaluation. Technical evaluation includes engineering tests to determine how the equipment meets performance requirements. Models must be electrically and mechanically equivalent to the final production item.

Other Tests

Other tests are required to determine producibility and reliability. Full production methods and tooling must be used to produce a pilot quantity, the number depending on the size of the expected quantity order.

An industry spokesman said last week that the most important factor in determining success of the new directive will be how well it is administered by military procurement officials. He said the order will be helpful to manufacturers because swift final determination of a product's suitability will let the manufacturer lay practical plans for production.

Missing link in the new procedure: a good definition of reliability. The Defense Department is trying to draft one that will meet all requirements and it will be circulated to the industry in the near future.

Congress Extends Renegotiation Law

Washington—Congress has given final approval to a two-year extension of the renegotiation law. Expiration date for the measure is now Dec. 31, 1958.

The extension, which the President is expected to sign as a matter of course, makes these three changes in the renegotiation statute:

- **Firms with less than** a $1 million annual volume of government business are exempted. Present floor is $500,000.
- **A two-year carry-forward** of losses will be applied against profits. At present, losses may be carried forward and applied against profits for one year only.
- **Contract business** with the Civil Aeronautics Administration and National Advisory Committee are exempted from renegotiation. At present, the contracts of 21 agencies are subject to renegotiation. The extension measure narrows it to eight: Department of Defense, Army, Navy, Air Force, Atomic Energy Commission, General Services Administration, Maritime Administration and the Federal Maritime Board.

REAR installation of two 1,000 hp. GE T58 turbine engines in Army H-21 helicopter is shown in silhouette view.

Turbines to Double H-21 Capability

Morton, Pa.—The Vertol H-21 helicopter's ton-mile transport capability per hour will be more than doubled by the installation of two General Electric T58 turbine engines.

The 1,000 hp. units will replace a 1,425 hp. Wright R1820-103 reciprocating engine. The first two helicopters are being equipped for the Army under a $1.8 million contract administered by the Navy Bureau of Aeronautics (AW Jan. 16, p. 23).

Improved performance of the H-21 will include a payload increase of 40%. Cruising speed will be 150 mph., 50 mph. faster than the present aircraft. In addition, Vertol says the hovering ceiling will be increased by "several thousand feet."

Already working on Civil Aeronautics Administration certification of the piston-powered H-21, Vertol President Don R. Berlin indicated last week that the company will make a strong bid for commercial sales of the newer version with T58 engines. The aircraft is in large-scale production and is the only one Vertol is presently building.

In short-haul service with T58 engines, the H-21 could carry up to 22 passengers. No figures have been given on seat-mile costs, but an aircraft of this type has been demanded by commercial operators to put helicopter shuttle service on a more sound financial basis.

Berlin said certification will be sought for the turbine-powered H-21, which will have multi-engine reliability and improved all-weather capability. Noise and vibration levels also will be reduced.

A Vertol spokesman said the two engines will be installed in the rear and consume less space than the present engine. Placement indicates they will be, for the most part, aft of the present engine position, filling up former waste space in the tail. They will drive the main rotor shaft from a central point and be installed so that failure of one unit will not affect operation of the other.

Improved servicing and maintenance features are expected from simplified oil and ignition systems.

Sikorsky Completes 1,000th S-55 Model

Sikorsky Aircraft last week completed its 1,000th S-55 type helicopter. The aircraft, undergoing flight test at Sikorsky's Bridgeport, Conn., factory, will be delivered to the Marine Corps this week.

Firm orders for the seven passenger helicopter, powered in commercial version by Pratt & Whitney R1340 engine and in military configuration by Wright R1300, indicate the S-55 will remain in production several more years, Sikorsky says.

Type 173 Helicopter Delivered to BEA

Bristol Type 173 twin-engine tandem rotor helicopter has been delivered to British European Airways for handling trials which are to last several weeks. Bristol says delivery was the first of a multi-engine helicopter to an airline.

Type 173, powered by 520 bhp. Alvis Leonides piston engines, is one of two prototypes built by Bristol for research in the twin-engine, tandem rotor configuration. Three more prototypes are being built, and the first will be powered by 850 bhp. Leonides Major engines.

Power installations, transmission systems and rotors of the Type 173 are essentially duplicates of those used in the single-engine Bristol Sycamore, of which 100 have been built. Type 173 is a forerunner of the Type 192, on order by the RAF, and which first will be powered by Leonides Major engines and later by Napier Gazelle gas turbines.

In the Type 173, the individual rotor gearboxes are connected by a synchronizing shaft, running along fuselage roof, that keeps rotors in phase. Engines are located below rotors, which rotate in opposite directions.

Light Helicopter Is Ordered by British

Saunders-Roe Skeeter, a light helicopter powered by a de Havilland Gypsy Major 200 four cylinder piston engine, is being ordered by Ministry of Supply for RAF Air Observation Post Squadrons.

Though light helicopters have been used before by the services, this is the first time they have been made available in sufficient quantity so that they can be employed as a piece of regular service equipment. Inlet-port fuel injection engine is rated at its maximum 200 bhp. for periods up to an hour. Top speed of Skeeter is 101 mph.

News Digest

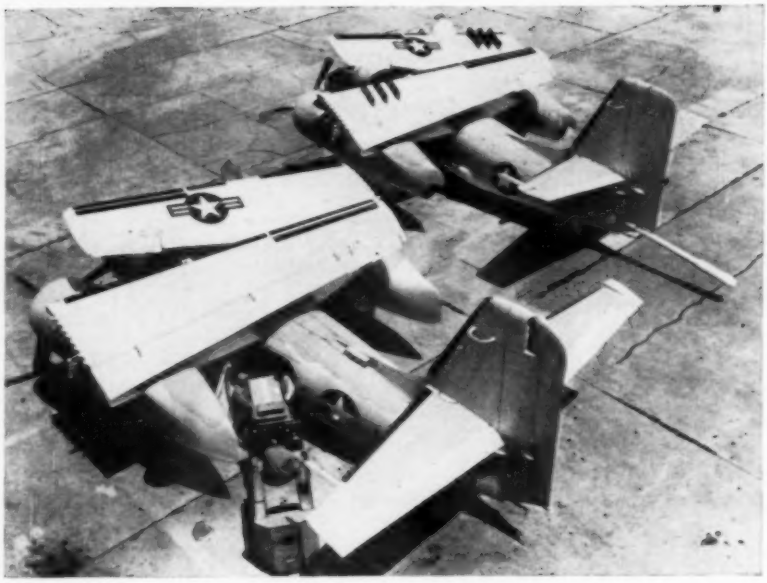
Russian model airplane builders will enter competition with western enthusiasts for the first time at World Championship Contest for powered models at Cranfield, England, on August 6. U.S. team will be unable to compete

in person unless last minute efforts to obtain sponsorship are successful. Russians, who hold many world model records, will be strong contenders, and under Federation Aeronautique Internationale rules, next year's competition will be held in Russia if they win.

Royal Norwegian Air Force has purchased 25 Saab 91B-2 Safir trainers now being built at Saab's plant in Linkoping, Sweden.

Invitations for bids to construct the academic complex of the Air Force Academy at Colorado Springs, Colo. will be issued August 21. Exterior walls of six-story 220,000 sq. ft. structure will be made of glass, aluminum, marble, masonry and stucco.

USAF contracts totalling $11,627,860 with Lockheed Air Service, Ontario, Calif., bring backlog to $30 million, include IRAN (inspection and repair as necessary) of F-94 all-weather fighters, maintenance checks and modifications of RC-121D early warning versions of the Super Constellation, crash repairs on jet fighters and trainers, modification kits for WV-2 Navy early warning aircraft, construction of C-130 mobile trainers.



S2F in Transport Version

TF-1 transport-cargo version (below) of Grumman S2F anti-submarine aircraft shows off deeper, bulkier fuselage with door placed just above where underside radome is mounted in S2F. Similarity of wing folding of two versions (top) shows how 70 ft. span overlaps at angle for maximum carrier stowage. S2F has MAD boom extended from tail.

Douglas YC-124B powered by four 5550 h.p. Pratt & Whitney T-34 turboprop engines.

How the Holley "hidden co-pilot" does two jobs with one handle control

Throughout the entire operational range of the new Douglas YC-124B, engine power and propeller governor setting must be precisely coordinated. This has always been a "two-handle" job but in this new airplane the job is done with a single control lever and the help of a Holley Power Control which functions like a "hidden co-pilot".

One of these controls installed on each 5550 horsepower Pratt & Whitney Aircraft T-34 engines automatically senses altitude, air temperature and speed and feeds the information to its nerve center —a series of precision manufactured 3-dimensional cams. These cams continuously interpret this information in terms of engine power which is automatically adjusted through precise metering of fuel by the control.

The Holley Power Control not only coordinates the engine and propeller for all forward thrust conditions but also controls the vital reversing of thrust necessary to reduce the aircraft's landing roll.

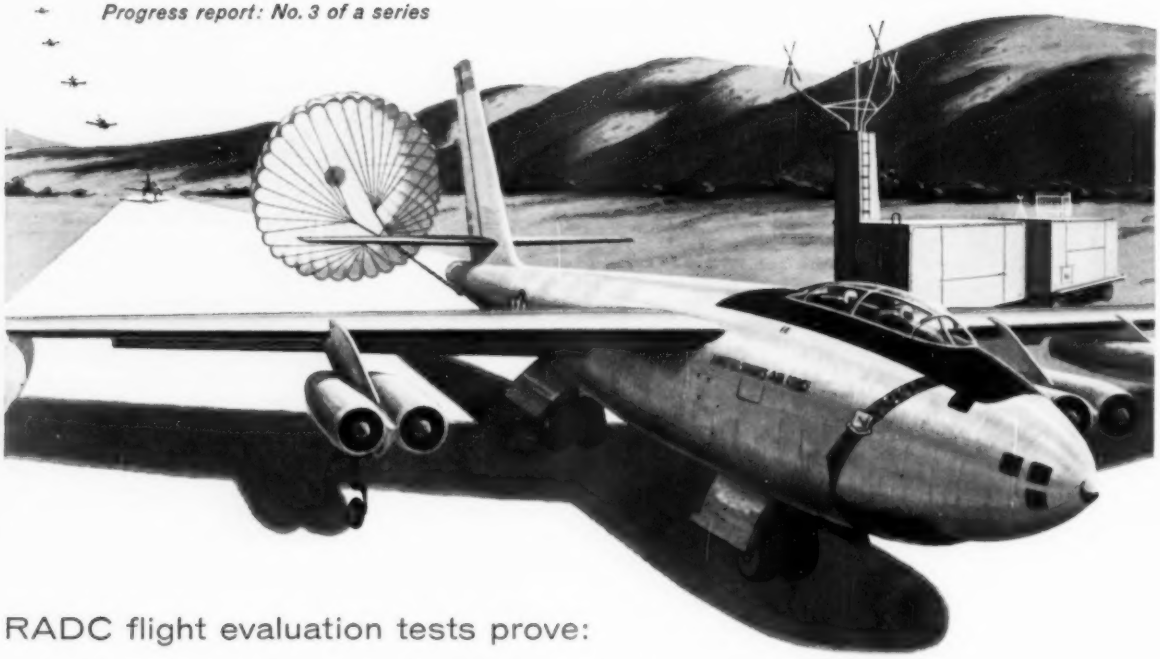
Designed, developed and manufactured by Holley, the "hidden co-pilot" is dependable, easy to service, compact and lightweight—four qualities that always distinguish Holley aviation equipment.

HOLLEY Carburetor Co.

11955 E. NINE MILE ROAD
VAN DYKE, MICHIGAN

LEADER IN THE DESIGN, DEVELOPMENT, AND MANUFACTURE OF AVIATION FUEL METERING DEVICES

Progress report: No. 3 of a series



RADC flight evaluation tests prove:

GILFILLAN AUTOMATIC GCA represents two outstanding advances in electronic navigation systems

1. PROVEN OPERATIONAL PERFORMANCE

Gilfillan Automatic GCA is building a remarkable record in Flight Evaluation Tests now under completion at Rome Air Development Center.

In Automatic Approach, the traffic handling capability is one aircraft every 30 seconds, or a sustained level of 120 aircraft per hour.

In test after test with mixed jet and piston traffic, Gilfillan AGCA is providing automatic approach, airborne data for pilot control or standard GCA talkdown, to individual aircraft in the same stream of traffic.

In either single-type or mixed traffic, AGCA provides *individual control plus protection of each aircraft as part of continuous traffic flow*, through continuous closed-loop control and automatic "moving block signal" overtake warning.

2. NEW BUILT-IN RELIABILITY

Commenting on the new simplified maintenance built into the Gilfillan Automatic GCA trailer, a USAF official remarks: "This simplified maintenance system is as great an advance in electronic design as Automatic GCA itself. It is clear that AGCA will surpass even standard Gilfillan GCA's high-reliability record."

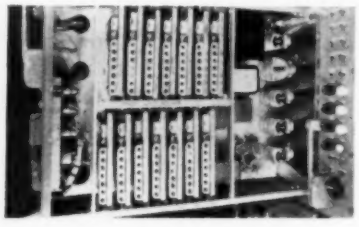
Instantly replaceable subminiature electronic plug-in card assemblies, pre-tested replacement stock, check-out bench with outstandingly simplified test equipment and a built-in aircraft simulator for operational check-out combine to provide quick 1-2-3 maintenance on the spot. Only minimum maintenance training is required.

Automatic GCA, now daily piling up new records in efficient performance and reliability, is the result of ten years of joint research and development by USAF Rome Air Development Center and Gilfillan.

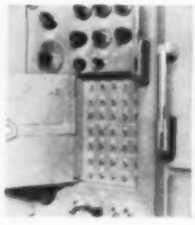
Gilfillan
Los Angeles

PRIME CONTRACTORS FOR COMPLETE SYSTEMS

Electronic Countermeasures / Automatic Navigational Aids
Missile Guidance Systems / Airborne Radar / Radar Trainers



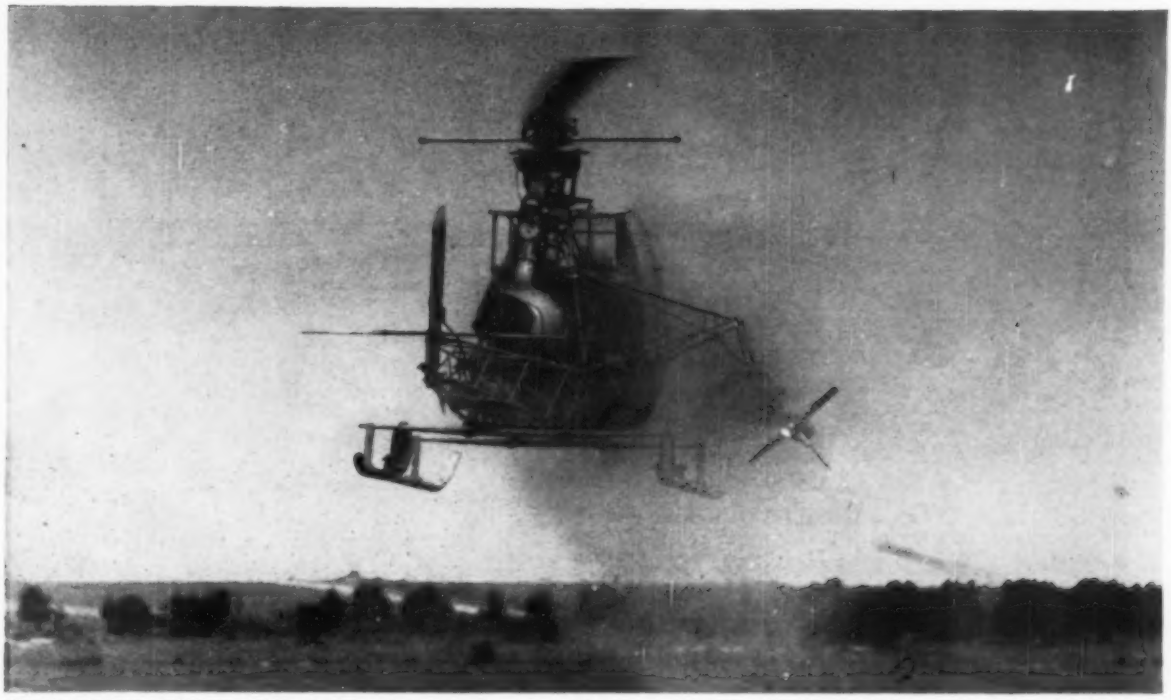
Card Construction



Aircraft Simulator

Simplified Test Equipment

French Djinn Helicopter Fires Air-to-Ground Missile



SO-1221 DJINN helicopter, adapted as an air-to-ground missile platform for study by the French military services, fires SS-10 missile from a tubular frame on the right side of the fuselage. Also among the Djinn's aerial cavalry roles are reconnaissance and liaison.

INTENDED for agricultural and industrial as well as military use, the Djinn is first turbine-powered copter to reach production. The rotor is driven by compressed air jets at the rotor tips. Air is supplied by a Turbomeca Palouste air generator. The Djinn holds the world altitude record for its category. Doman Helicopters has proposed the U. S. Army try a similar system (AW July 16, p. 29).

CAPITAL Airlines Comet IVA will have seven feet clipped off wing, will be powered by Rolls-Royce Avon R.A.29 Engines.

Capital Orders 14 de Havilland Comets

U. S. airline purchases medium-range British jet; passenger flights are scheduled for January 1959.

By Craig Lewis

Washington—Capital Airlines last week made its second bid to the British aircraft industry in its campaign to lead the U.S. jet equipment race with an order for 14 de Havilland Comet IV turbojet transports.

With its $53 million Comet order, Capital probably will become the first U.S. airline to operate turbojet equipment, just as it was the first American carrier to use turboprop equipment when it introduced the Vickers Viscount a year ago.

Sale of the Comet to an American airline gives new vitality to de Havilland's languishing sales program. Before Capital ordered the British jet transport, British Overseas Airways Corporation was the only customer. BOAC has an order for 19 Comets.

First Comet in 1958

Capital's President James H. Carmichael said the airline chose the Comet because it best fits Capital's operation and because it will give the airline a transport that can compete with new turbine aircraft other U.S. airlines will introduce within three years.

Carmichael said Capital's introduction of the Comet early in 1959 will maintain the airline's lead position in the equipment race, placing it in the jet age six months to a year ahead of other U.S. carriers.

The first Comet is scheduled for delivery to Capital in November, 1958. Deliveries are to be completed by December, 1959. British Overseas Airways Corp. will get its first Comet in July, 1958.

Capital is arranging private financing for the Comet and for a recently-placed order for 15 more Viscounts. While no details of the financing were announced, Carmichael said no new equity financing will be necessary and that Capital "hopes eventually to use all U.S. capital."

The Capital president said he does not expect any passenger resistance to the airliner despite the widely-reported disasters that grounded the Comet I in 1954. He said any shortcomings inherent in earlier Comet operations have been offset by extensive research and redesign by de Havilland. The Comet, he added, is "without question the safest airplane we could operate."

Comet 4A

Four of Capital's new transports will be the standard Comet IV; the other ten will be Comet IVAs, a clipped-wing stretched fuselage model designed to adapt the Comet to Capital's special requirements. Both models will be pow-

Comet 4A

Passengers	74
Engines, 4 Rolls-Royce Avon R.A.29 Jet Engines	42,000 lbs. thrust
Wing Span	108 ft.
Length	111½ ft.
Height	28½ ft.
Fuel Capacity	10,380 U.S. gal.
Maximum Take-Off Weight	152,500 lbs.
Capacity Payload	22,700 lbs.
Crew	5
Cruising Speed	545 mph.
Cruising Altitude	up to 45,000 ft.
Range (Full Passenger Load)	2,900 miles

cred by four Rolls-Royce Avon R.A.29 turbojet engines.

Capital's version of the standard Comet IV will carry 70 passengers in first-class service. The Comet IVA will have a wingspan seven feet shorter than the Comet IV and a 40-inch-longer fuselage.

The IVA will carry 74 first-class passengers—68 in two abreast cabin seating and six in lounge seats. It will carry 92 coach passengers in coach service.

Carmichael said his company bought the Comet after deciding that the Douglas DC-8, the Boeing 707 and the Convair 880 would be economically unsound for its particular routes.

Before the Comet order, Capital had been interested in the Bristol Britannia. Carmichael said the airline decided to reject the Britannia since it would be only an interim step before the inevitable purchase of turbojets.

The airline also looked at the French SNCASE Caravelle. The airliner was not seriously considered, however, because it has two engines, and Capital feels the U.S. public is sold on the idea of four-engine transports.

Capital plans to put the Comet into service in January, 1959, two months after delivery of the first airplane in November, 1958. The airliner will be used initially on Washington-Chicago and New York-Chicago runs, two of Capital's best routes.

The airline already has had considerable success with the Viscount on these routes and hopes to retain its position with early introduction of turbojet service. On the Washington-Chicago route, Capital carried 8,041 passengers in the first quarter of 1955. With the Viscount serving the route, Capital increased this traffic to 24,123 passengers in the first quarter of this year.

Capital's Comet IVA is a medium-range transport. The modification is designed to provide high speed performance economically at lower altitude. The IVA will cruise at 545 mph. at 23,500 ft., and Carmichael said it probably will be faster than the large turbojet transports in elapsed time over short routes.

The modification cuts the range of the Comet IV, but Capital's short routes do not require long-range capability. The IVA will operate from 6,000 ft. runways and will have maneuver and approach speeds similar to those of present large piston engine transports.

Capital says noise will be no problem. De Havilland intends to install corrugated jet-pipe nozzles on the aircraft, and quick takeoff and climb capabilities are expected to lower the noise level over built-up areas. Carmichael expects de Havilland to have both noise suppression and reverse thrust problems solved by the time the Comet is delivered in 1958.

De Havilland will set up a spares store in the United States to service the Comets, and Capital's supervisory and check pilots will train at the factory and in cooperation with BOAC. Capital had a similar spares and training arrangement with Vickers when it introduced the Viscount.

A key factor in the scheduled introduction of the Comet on Capital's routes is certification of the new airplane by the Civil Aeronautics Administration. Carmichael said he expected no difficulty with certification. Three CAA officials will go to England August 20 to start the certification process.

British Would Finance Purchase

London—If necessary British Government is prepared to guarantee loans to Capital for Comet financing, according to de Havilland. (London report on the Capital order was an AVIATION WEEK exclusive July 23.)

"Since the Viscount deal with Vickers in which financing was arranged in this country," de Havilland said, "success of Capital has enabled it to go to U.S. sources to obtain financing there for Comet. We believe quite clearly they can get financing in the U.S."

Any British backing would be handled through Export Credit Authority. Capital also has agreement that British will repurchase first four Comet IVs after IVA has been delivered. Capital holds options on further Comets although de Havilland Managing Director A. F. Burke describes them as, "not firm."

Regarding other prospects he said, "We don't know whether they are hot or warm or cold, but we have a lot of deals under discussion." BEA, which is planning to use jets on longer routes, is expected to place early Comet order although Burke would not comment.

Regarding Comet's past troubles, Burke said development work has given company confidence that the problem has been solved. The company still is in the middle of a lot of test work.

De Havilland will set up two assembly lines, the first at Hatfield and the second at Chester. Seventy-five percent of production drawings already have been issued and tooling is under way.

Some of the tools for Comet I can be adapted, but it is "fairly complete retooling job."

Fuselage has been beefed up with considerable window reinforcement and heavier material equivalent to ST 24 will be used in construction. Slightly less Redux will be used and partial skin milling will be employed. Comet II is now in shop having fuselage lengthened and wingtips cut off to make it aerodynamically the same as IVA. It also is being fitted with R.A.29 engines. There will be no Comet IV prototype as such. Two Comet IIs each will be fitted with two R.A.29s and two R.A.26s to act as flying testbeds.

First flight is scheduled for early 1958 and production is expected to reach two per month by end of the year. De Havilland is tooling for eventual one per week production.

Rolls-Royce says R.A.29 has completed 150 hr. test to CAA schedule.

Thirty-two engines are being built for bench, flight testing. Although somewhat heavier than earlier engine, fuel consumption will be better. Stage has been added to front of compressor, making turbine three-stage against two in earlier engine. Engine performance figures are still classified secret by Ministry of Supply. There is no restrictive commercial arrangement on sale of this engine such as the one on the Dart.

Capital order will soften political repercussions here of the announcement expected shortly that BOAC has decided to buy American jets for North Atlantic—a dollar expenditure which will require cabinet approval. BOAC will get at least four of its twenty Comets before Capital gets its first four.

Airline Stock Outlook Shows Improvement

The recent and substantial progress made by the nation's airlines has brought the industry to a position where airline stock should begin to fulfill the optimistic market expectations of ten years ago, according to a report to investors prepared by a leading brokerage group.

Merrill Lynch, Pierce, Fenner and Beane has produced a survey of the airlines tracing the extraordinary growth of the airlines and painting an optimistic picture of future prospects for investors interested in airline stocks.

Noting that most airline stocks have "hardly been stellar performers" and have lagged far behind what would be considered good performance for growth stocks, the Merrill Lynch study added: "In view of the great strides which have been made in recent years, the airline shares should someday make up for lost time and fulfill the market anticipation of 1945-46."

Merrill Lynch said much of the reluctance to invest in airline stocks is historical and stems from the heavy losses suffered in the 1946-48 period. Shifting government policies, growing expenses and erratic earnings are cited as other factors that have discouraged investors.

The report concludes that the airlines' business potential is tremendous

and that the carriers have undertaken the expansion needed to satisfy it. Whether or not the airlines will be able to turn the traffic potential into handsome profits, Merrill Lynch said, depends upon management ability and government policy.

The answer to this question lies in the future, the survey said, but "already some of the finest financial brains in the world are betting hundreds of millions the industry is headed for smooth high flying."

Merrill Lynch feels the fact that much of the money for fleet expansion is coming from insurance companies is very significant. One reason cited for the confidence of the insurance companies is the expected long life of the jet. The fact that the jet transport is considered a 15-20 year airplane is viewed as a stabilizing factor in the airline equipment situation.

Airline plans for financing their expansion have "very interesting connotations for shareholders," according to the report.

Merrill Lynch points out that the large carriers will rely heavily on debt and internal cash sources for new equipment with very little need of new equity. Thus, the carriers may double or triple in size in the next five years while the number of shares remains unchanged.

In terms of growth, Merrill Lynch said the airlines have outstripped other growth industries. Compared to 1939, air travel has grown 30 times compared with a 15-fold increase for plastics, tenfold for aluminum and eightfold for chemicals. In the transportation field, the airlines have outgrown the railroad and bus industries.

The report found that the development of air travel as a mass transportation medium is one of the most significant facts of recent airline growth. Recalling CAB Vice Chairman Joseph P. Adams' statement that the industry ratio should be 80% coach service and 20% first class service, Merrill Lynch observed that the ratio is moving in that direction and found that the airlines are "excellent merchants of transportation."

Noting that there has been some concern over new competition recently created by the CAB, the survey said: "Experience has shown that the entry of new competitors into areas formerly served by one carrier has meant only a temporary diversion of traffic from the route pioneer. More important, it has usually resulted in much better development of the area's traffic potential."

Railroads React to Competition

New York—The two largest passenger-carrying railroads in the country may be planning to abandon their first-class traffic to the airlines.

New York Central Chairman Robert R. Young said last week that the railroads' passenger operation "cannot much longer withstand the unfair competition of subsidized motor, air and water carriers."

Young was reacting to reports that New York Central and Pennsylvania plan to raise first-class fares about 50% to price themselves out of the market deliberately. The scheme, which would involve asking the Interstate Commerce Commission for the increases because of inability to meet airline competition at present levels, reportedly was discussed at a recent meeting of Eastern railroad traffic managers. Only Pennsylvania and New York Central are said to have endorsed the plan.

Neither railroad would confirm or deny the report directly. Pennsylvania President James M. Symes, who has been quoted as saying, "I've just about given up hope as to the future of real long-haul passenger travel," was unavailable for comment last Wednesday.

A Pennsylvania spokesman said, however, that the report was misleading and its conclusion "unjustified." The railroad, the spokesman said, denied "any fear of price increases injuring our passenger business." He pointed out that the Pennsylvania has $1 billion invested in passenger facilities, is buying new passenger equipment, and is "exploring the possibility of reducing passenger expenses."

But, the spokesman refused to confirm or deny the reported 50% increase proposal, and would not say whether the "new equipment" would go into first-class or coach service.

Young's statement did not touch on the fare increase, either, and a Pennsylvania official had "no comment" on the fare increase. Young cited government financing of "beacons and meterology service" as well as use of taxpayers' money for an airways safety program as among the unfair advantages enjoyed by the airlines.

If all railroads in the Eastern district pulled out of the parlor car and sleeper passenger business, 8,514,000 passengers would be looking for other means of transportation, according to last year's figures. Total first-class business for U.S. railroads was 16,785,000 passengers.

Revenues brought to Eastern division rail lines last year by the first-class passengers totaled $101,561,000, according to preliminary reports. For the whole U.S., the tentative total was $213,503,000. Airlines had little comment on the report.

Fate of Nonsked Lines Clouded by Ruling

Washington—The fate of the nonscheduled airline industry is uncertain once more as the result of a U.S. Court of Appeals decision which questions the Civil Aeronautics Board's decision to issue exemptions to the carriers for the new supplemental air carrier operations.

The partial reversal of the CAB's historic decision in the Large Irregular Case (AW, Nov. 21, p. 12) is a victory for the scheduled airlines and casts a shadow over the future of an industry which has been hampered by regulatory indecision in its ten-year history.

The ruling by the U.S. Court of Appeals for the District of Columbia vacates CAB's decision in the Large Irregular Case after August 3 unless one of the parties moves for reconsideration. The Air Coach Transport Assn. plans to move this week for a rehearing and for a stay.

This latest turn in the fortunes of the irregular carriers came as the result of the violent objections of the scheduled airlines to CAB's decision in the marathon Large Irregular Case. After four years of litigation, the Board decided last November to establish a new class of supplemental air service for the irregular carriers.

Under the new authority, the carriers were authorized to conduct unlimited domestic charter operations and cargo charter operations in foreign service. They also were authorized to operate ten scheduled flights a month between any two points.

The scheduled carriers objected strongly to the ten flight provision and asked the Court of Appeals to review the CAB action. Now the Court has remanded the case to the CAB for further action.

The Court accepted the CAB decision to establish a new type of air service, but it objected to the way the Board did it. It said CAB failed to offer sufficient evidence to support use of exemptions to authorize the new supplemental service.

To issue such exemptions, CAB is supposed to prove that it would be an undue burden on the irregular carriers to make them go through certificate proceedings to get their authority to operate as supplemental air carriers.

Referring to CAB's Large Irregular Case decision, Court of Appeals Judge E. Barrett Prettyman said: "There is nothing to indicate upon what facts or findings the Board based its conclusion that a requirement of certification would be an undue burden upon these carriers. The opinion and the order leave us at a complete loss upon that subject."

Airline Helps Brazil Integrate Economy

By Peter Weaver

Rio de Janeiro—One of the world's largest route systems criss-crosses its way from civilization into the Stone Age and back out again.

The 286,219-mile complex is the property of Correio Aereo Nacional, a government-owned airline charged with spearheading Brazil's attack to pry open its dormant, potentially-rich interior.

Primary obstacle in the airline's path when it began its all-out push into the interior less than 10 years ago was the imposing, almost-impenetrable Mato Grosso jungle. The jungle, which slashes across the center of Brazil, separates the coastal commercial centers from the river ports of the Amazon.

Until CAN began its drive, commercial flights over the jungle were almost universally prohibited. Today, commercial airliners fly overhead on scheduled flights to Manaus and Boa Vista to the north, and the Mato Grosso is dotted with small, compact airstrips.

To show just how far it has progressed in its attack on the interior, CAN invited AVIATION WEEK on a 10-day flight that covered 9,000 miles and included 22 stops in 12 different states and federal territories.

A typical airstrip was Xavantina, first jungle stop after the civilization of the coastal plains had passed.

Xavantina's 1,600-meter strip of crushed rock was initially cleared from the jungle by a 12-man expeditionary force, who fought their way overland, cleared room enough to handle a Piper Cub and then pushed on to the next scheduled stop in the jungle complex at Xingu.

Air force engineers and civilian laborers met their greatest challenge in the construction of Cachimbo, an airstrip set deep within the Mato Grosso.

Shortly after leaving Xingu and still 200 miles short of its goal, the expeditionary force found trees and undergrowth impenetrable. Expeditionary leaders ordered a light plane shipped up the river in sections aboard dugout canoes. It was reassembled and then flown out of the camp until it managed to locate a landing spot along a small clearing of sandy beach near the present site of Cachimbo.

Later, it shunted in the necessary supplies and workers needed to clear a 2,200-meter airstrip capable of handling four-engine aircraft.

Also laid out were a rock-crushing plant, maintenance shops, a modern weather station, an automatic hydroelectric plant, stone houses for permanent and itinerary personnel and complete vegetable and animal farms. Every item of machinery and every animal for the farm was flown in by Douglas C-47.

CAN now serves 600 communities and plans to build another 15 airfields and enlarge 52 of those already in operation.

Availability of this jungle complex has closed the flying time from Rio de Janeiro to Manaus from a coast-hugging journey of several days to seven hours non-stop and has encouraged Real-Aerovias to inaugurate a "down-the-center" schedule between Miami and Rio by way of Manaus (AW July 23, p. 46). Several other cargo and passenger-carrying airlines have followed CAN into the interior, serving cities and villages where an airplane was virtually unknown 10 years ago.

The AVIATION WEEK flight from Rio included preliminary stops at Goianai, capital of the agricultural state of Goiza, and Aragarcas, CAN's final brush with civilization before stepping off into the Mato Grosso.

Although still outside the jungle, Aragarcas is one of the Brazilian cities that hopes CAN can help it retrieve a half-forgotten, rubber-inspired past that has left it with a empty 40-room hotel and a modern, seldom used, hospital.

Runways at Aragarcas are hard-topped but only 1,200 meters in length. Goiania, already serviced by Real-Aerovias, Cruzeiro do Sul, VASP, Nacional and Loide Aero Airlines, is constructing a new airport with 2,500-meter runways to replace its present 1,400-meter clay-and-gravel strips.

Another stop, Manaus, once a giant of the Amazon ports during the rubber heyday, is reviving economically under the twin influences of CAN and oil. The latter has provided the city with a new, 5,000-barrel-a-day refinery and a modern hotel.

Other stops included:

• **Porto Velho,** CAN's southwestern apex and an "ocean outlet" for Bolivia.

• **Cuiaba,** capital of the mineral and agricultural state of Mato Grosso. With new industries moving in (including U. S. Steel), Cuiaba is going through a small boom. Its airfield, opened in December, has a 1,600-meter strip.

• **Campo Grande,** which has one of the largest all-paved airfields in South America (2,470 meters) and is served by VASP, Real-Aerovias, Panair do Brasil, Nacional, Cruzeiro do Sul and several air-taxi lines.

• **Tres Lagoas,** agricultural supply depot for Sao Paulo. Serviced by Panair do Brasil and Nacional, Tres Lagoas experienced a 25% increase in scheduled airline traffic last year.

(This is the second of two articles on the Brazilian airline, Correio Aereo Nacional.)

and that the carriers have undertaken the expansion needed to satisfy it. Whether or not the airlines will be able to turn the traffic potential into handsome profits, Merrill Lynch said, depends upon management ability and government policy.

The answer to this question lies in the future, the survey said, but "already some of the finest financial brains in the world are betting hundreds of millions the industry is headed for smooth high flying."

Merrill Lynch feels the fact that much of the money for fleet expansion is coming from insurance companies is very significant. One reason cited for the confidence of the insurance companies is the expected long life of the jet. The fact that the jet transport is considered a 15-20 year airplane is viewed as a stabilizing factor in the airline equipment situation.

Airline plans for financing their expansion have "very interesting connotations for shareholders," according to the report.

Merrill Lynch points out that the large carriers will rely heavily on debt and internal cash sources for new equipment with very little need of new equity. Thus, the carriers may double or triple in size in the next five years while the number of shares remains unchanged.

In terms of growth, Merrill Lynch said the airlines have outstripped other growth industries. Compared to 1939, air travel has grown 30 times compared with a 15-fold increase for plastics, tenfold for aluminum and eightfold for chemicals. In the transportation field, the airlines have outgrown the railroad and bus industries.

The report found that the development of air travel as a mass transportation medium is one of the most significant facts of recent airline growth. Recalling CAB Vice Chairman Joseph P. Adams' statement that the industry ratio should be 80% coach service and 20% first class service, Merrill Lynch observed that the ratio is moving in that direction and found that the airlines are "excellent merchants of transportation."

Noting that there has been some concern over new competition recently created by the CAB, the survey said: "Experience has shown that the entry of new competitors into areas formerly served by one carrier has meant only a temporary diversion of traffic from the route pioneer. More important, it has usually resulted in much better development of the area's traffic potential."

Railroads React to Competition

New York—The two largest passenger-carrying railroads in the country may be planning to abandon their first-class traffic to the airlines.

New York Central Chairman Robert R. Young said last week that the railroads' passenger operation "cannot much longer withstand the unfair competition of subsidized motor, air and water carriers."

Young was reacting to reports that New York Central and Pennsylvania plan to raise first-class fares about 50% to price themselves out of the market deliberately. The scheme, which would involve asking the Interstate Commerce Commission for the increases because of inability to meet airline competition at present levels, reportedly was discussed at a recent meeting of Eastern railroad traffic managers. Only Pennsylvania and New York Central are said to have endorsed the plan.

Neither railroad would confirm or deny the report directly. Pennsylvania President James M. Symes, who has been quoted as saying, "I've just about given up hope as to the future of real long-haul passenger travel," was unavailable for comment last Wednesday.

A Pennsylvania spokesman said, however, that the report was misleading and its conclusion "unjustified." The railroad, the spokesman said, denied "any fear of price increases injuring our passenger business." He pointed out that the Pennsylvania has $1 billion invested in passenger facilities, is buying new passenger equipment, and is "exploring the possibility of reducing passenger expenses."

But, the spokesman refused to confirm or deny the reported 50% increase proposal, and would not say whether the "new equipment" would go into first-class or coach service.

Young's statement did not touch on the fare increase, either, and a Pennsylvania official had "no comment" on the fare increase. Young cited government financing of "beacons and meterology service" as well as use of taxpayers' money for an airways safety program as among the unfair advantages enjoyed by the airlines.

If all railroads in the Eastern district pulled out of the parlor car and sleeper passenger business, 8,514,000 passengers would be looking for other means of transportation, according to last year's figures. Total first-class business for U. S. railroads was 16,785,000 passengers.

Revenues brought to Eastern division rail lines last year by the first-class passengers totaled $101,561,000, according to preliminary reports. For the whole U. S., the tentative total was $213,503,000. Airlines had little comment on the report.

Fate of Nonsked Lines Clouded by Ruling

Washington—The fate of the nonscheduled airline industry is uncertain once more as the result of a U. S. Court of Appeals decision which questions the Civil Aeronautics Board's decision to issue exemptions to the carriers for the new supplemental air carrier operations.

The partial reversal of the CAB's historic decision in the Large Irregular Case (AW, Nov. 21, p. 12) is a victory for the scheduled airlines and casts a shadow over the future of an industry which has been hampered by regulatory indecision in its ten-year history.

The ruling by the U. S. Court of Appeals for the District of Columbia vacates CAB's decision in the Large Irregular Case after August 3 unless one of the parties moves for reconsideration. The Air Coach Transport Assn. plans to move this week for a rehearing and for a stay.

This latest turn in the fortunes of the irregular carriers came as the result of the violent objections of the scheduled airlines to CAB's decision in the marathon Large Irregular Case. After four years of litigation, the Board decided last November to establish a new class of supplemental air service for the irregular carriers.

Under the new authority, the carriers were authorized to conduct unlimited domestic charter operations and cargo charter operations in foreign service. They also were authorized to operate ten scheduled flights a month between any two points.

The scheduled carriers objected strongly to the ten flight provision and asked the Court of Appeals to review the CAB action. Now the Court has remanded the case to the CAB for further action.

The Court accepted the CAB decision to establish a new type of air service, but it objected to the way the Board did it. It said CAB failed to offer sufficient evidence to support use of exemptions to authorize the new supplemental service.

To issue such exemptions, CAB is supposed to prove that it would be an undue burden on the irregular carriers to make them go through certificate proceedings to get their authority to operate as supplemental air carriers.

Referring to CAB's Large Irregular Case decision, Court of Appeals Judge E. Barrett Prettyman said: "There is nothing to indicate upon what facts or findings the Board based its conclusion that a requirement of certification would be an undue burden upon these carriers. The opinion and the order leave us at a complete loss upon that subject."

Airline Helps Brazil Integrate Economy

By Peter Weaver

Rio de Janeiro—One of the world's largest route systems criss-crosses its way from civilization into the Stone Age and back out again.

The 286,219-mile complex is the property of Correio Aereo Nacional, a government-owned airline charged with spearheading Brazil's attack to pry open its dormant, potentially-rich interior.

Primary obstacle in the airline's path when it began its all-out push into the interior less than 10 years ago was the imposing, almost-impenetrable Mato Grosso jungle. The jungle, which slashes across the center of Brazil, separates the coastal commercial centers from the river ports of the Amazon.

Until CAN began its drive, commercial flights over the jungle were almost universally prohibited. Today, commercial airliners fly overhead on scheduled flights to Manaus and Boa Vista to the north, and the Mato Grosso is dotted with small, compact airstrips.

To show just how far it has progressed in its attack on the interior, CAN invited AVIATION WEEK on a 10-day flight that covered 9,000 miles and included 22 stops in 12 different states and federal territories.

A typical airstrip was Xavantina, first jungle stop after the civilization of the coastal plains had passed.

Xavantina's 1,600-meter strip of crushed rock was initially cleared from the jungle by a 12-man expeditionary force, who fought their way overland, cleared room enough to handle a Piper Cub and then pushed on to the next scheduled stop in the jungle complex at Xingu.

Air force engineers and civilian laborers met their greatest challenge in the construction of Cachimbo, an airstrip set deep within the Mato Grosso.

Shortly after leaving Xingu and still 200 miles short of its goal, the expeditionary force found trees and undergrowth impenetrable. Expeditionary leaders ordered a light plane shipped up the river in sections aboard dugout canoes. It was reassembled and then flown out of the camp until it managed to locate a landing spot along a small clearing of sandy beach near the present site of Cachimbo.

Later, it shunted in the necessary supplies and workers needed to clear a 2,200-meter airstrip capable of handling four-engine aircraft.

Also laid out were a rock-crushing plant, maintenance shops, a modern weather station, an automatic hydro-electric plant, stone houses for permanent and itinerary personnel and complete vegetable and animal farms. Every item of machinery and every animal for the farm was flown in by Douglas C-47.

CAN now serves 600 communities and plans to build another 15 airfields and enlarge 52 of those already in operation.

Availability of this jungle complex has closed the flying time from Rio de Janeiro to Manaus from a coast-hugging journey of several days to seven hours non-stop and has encouraged Real-Aerovias to inaugurate a "down-the-center" schedule between Miami and Rio by way of Manaus (AW July 23, p. 46). Several other cargo and passenger-carrying airlines have followed CAN into the interior, serving cities and villages where an airplane was virtually unknown 10 years ago.

The AVIATION WEEK flight from Rio included preliminary stops at Goianai, capital of the agricultural state of Goiza, and Aragarcas, CAN's final brush with civilization before stepping off into the Mato Grosso.

Although still outside the jungle, Aragarcas is one of the Brazilian cities that hopes CAN can help it retrieve a half-forgotten, rubber-inspired past that has left it with a empty 40-room hotel and a modern, seldom used, hospital.

Runways at Aragarcas are hard-topped but only 1,200 meters in length. Goiania, already serviced by Real-Aerovias, Cruzeiro do Sul, VASP, Nacional and Loide Aero Airlines, is constructing a new airport with 2,500-meter runways to replace its present 1,400-meter clay-and-gravel strips.

Another stop, Manaus, once a giant of the Amazon ports during the rubber heyday, is reviving economically under the twin influences of CAN and oil. The latter has provided the city with a new, 5,000-barrel-a-day refinery and a modern hotel.

Other stops included:

• **Porto Velho,** CAN's southwestern apex and an "ocean outlet" for Bolivia.

• **Cuiaba,** capital of the mineral and agricultural state of Mato Grosso. With new industries moving in (including U. S. Steel), Cuiaba is going through a small boom. Its airfield, opened in December, has a 1,600-meter strip.

• **Campo Grande,** which has one of the largest all-paved airfields in South America (2,470 meters) and is served by VASP, Real-Aerovias, Panair do Brasil, Nacional, Cruzeiro do Sul and several air-taxi lines.

• **Tres Lagoas,** agricultural supply depot for Sao Paulo. Serviced by Panair do Brasil and Nacional, Tres Lagoas experienced a 25% increase in scheduled airline traffic last year.

(This is the second of two articles on the Brazilian airline, Correio Aereo Nacional.)

Airline Income and Expenses—May 1956

	Passenger Revenue	Mail Revenue	Express Revenue	Freight Revenue	Subsidy	Total Operating Income	Total Operating Expenses	Net Operating Income (before taxes)
DOMESTIC TRUNK								
American	$21,651,550	$575,097	$310,454	$1,168,921		$24,021,282	$21,071,975	$2,949,307
Braniff	3,541,352	100,708	53,839	100,924		3,877,923	3,465,891	412,032
Capital	5,015,873	110,161	73,532	85,778		5,352,939	5,449,418	−96,479
Continental	1,318,577	33,809	13,115	39,806	$104,398	1,548,539	1,416,898	131,640
Delta	5,041,203	136,485	95,391	154,005		5,555,031	4,902,658	652,373
Eastern	15,135,558	309,896	159,333	202,145		16,212,896	14,777,584	1,435,312
National	3,451,351	77,139	19,047	105,362		3,811,166	3,166,033	734,473
Northeast	652,382	10,359	8,306	17,315	136,616	837,262	824,202	13,060
Northwest	3,769,977	140,581	85,497	168,954		4,226,272	4,193,775	32,496
Trans World	13,168,641	348,073	312,554	377,511		14,432,879	15,312,731	−879,852
United	19,225,774	783,816	348,817	849,273		21,351,830	19,402,037	1,949,793
Western	2,444,888	76,229	31,089	48,472		2,626,547	2,365,035	261,511
INTERNATIONAL								
American	295,398	12,598	176	63,611		389,253	391,277	−2,024
Braniff	449,727	115,932		26,962		619,717	563,284	56,432
Caribbean Atlantic	97,396	1,785		3,478		110,917	108,839	2,078
Colonial*								
Delta	384,812	5,175		11,301		415,489	382,329	33,160
Eastern	835,366	24,344		15,743		955,149	849,221	105,928
National	286,951	3,444	1,435	7,712		308,337	334,928	−26,591
Northwest	1,236,641	500,155	3,841	265,537		2,122,745	1,955,895	166,850
Pan American								
Alaska	365,000	21,000		91,000	113,000	685,000	592,000	93,000
Atlantic	8,177,000	756,000		684,000	176,000	10,452,000	9,302,000	1,150,000
Pacific	3,985,000	648,000		463,000	36,000	5,710,000	5,180,000	530,000
Latin America	4,725,000	254,000		841,000	510,000	6,822,000	7,040,000	−218,000
Panagra	1,136,491	79,480		145,745		1,579,868	1,497,441	82,427
Trans World	4,950,002	662,884		303,745		6,248,670	6,021,715	226,955
United	967,279	43,156		16,168		1,048,714	833,832	214,882
LOCAL SERVICE								
Allegheny	398,443	7,166	10,800	3,573	135,815	564,271	605,766	−41,495
Bonanza	135,891	2,998	1,885	4,453	104,823	264,953	261,703	3,250
Central	102,173	3,251	1,135	3,331	168,209	279,527	277,162	−2,365
Frontier	237,977	222,079	3,687	21,088		494,617	481,059	13,558
Lake Central	122,118	2,840	5,358		106,926	239,886	222,669	17,216
Mohawk	406,661	5,287	4,000	7,286	52,125	491,129	481,486	9,643
North Central*								
Ozark	268,411	354,989	6,112	4,504		638,379	477,948	160,431
Piedmont	418,741	8,880	7,640	5,863	117,942	628,713	646,561	−17,848
Southern	162,920	7,972	5,400		134,572	326,354	338,716	−12,361
Southwest	250,563	9,564	3,402	3,547	78,672	363,923	414,273	−50,350
Trans-Texas	248,397	9,434	4,287	8,517	194,187	471,667	477,873	−6,206
West Coast	187,515	3,183	1,539	3,612	140,637	341,297	331,187	10,110
HAWAIIAN								
Hawaiian	296,194	4,346		61,837	19,352	407,620	424,824	−27,045
Trans-Pacific	131,790	694		6,391	4,392	146,405	169,671	−23,265
CARGO LINES								
Aerovias Sud Americana				164,048		167,080	163,824	3,256
Flying Tiger	85,539			689,799		786,344	948,939	−162,595
Slick	1,061,319	13,345		613,261		1,824,961	1,628,438	196,523
Riddle*								
HELICOPTER								
New York Airways	27,122	2,745	1,322	2,451	109,412	148,252	152,240	−3,987
Los Angeles Airways	8,189	12,149	8,045		56,856	87,835	96,682	−8,846
Helicopter Air Service		44,328				44,925	44,690	235
ALASKAN								
Alaska Airlines	137,403	44,624	1,103	78,282	96,049	511,281	495,579	15,702
Alaska Coast	56,985	10,895	6,622		30,057	115,695	96,512	19,182
Byers Airways	3,526	1,652		868	4,120	11,658	9,689	1,969
Cordova	14,319	24,685		7,751		114,254	117,887	−3,632
Ellis Air Lines	40,650	5,165		6,109	22,041	83,198	73,950	9,248
Northern Consolidated	50,050	24,618	251	35,090	39,012	196,265	214,004	−17,739
Pacific Northern*								
Reeve Aleutian	39,617	18,254		7,660		91,149	81,200	9,949
Wien Alaska	48,009	40,548		21,369	36,315	586,949	507,294	79,654

*Not available.

Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board.

Pacific Air Traffic Grows; Olympics Help

By Bernie Lang

Los Angeles—Scheduled air carriers serving the Pacific area are experiencing the heaviest vacation traffic season in their history. Not only are they flying approximately one-quarter more passengers than in record-breaking peak months of 1955, but the heavy season is expected to extend beyond the vacation months into November.

One big reason is the Sixteenth World Olympic Games being held in Melbourne, Australia, calling attention to the whole Pacific area. Furthermore, one of the heaviest sectors of Pacific travel, the Mainland-Hawaii run, has thousands more visitors pouring into the islands, where new hotel construction can take care of more tourists than ever before. Japan, too, is rapidly resuming its postwar position as a travel center and expects to have more tourists visit the country this year than in any prewar year.

PASSENGERS ABOARD Japan Air Lines DC-6B "Pacific Courier" are served by stewardesses. In keeping with oriental atmosphere, one stewardess always wears traditional kimono. Airline serves western food such as steak, but specializes in Japanese cuisine.

Business Increase

Along with heavy tourist travel there has been a steady increase of trade with the Far East and more and more businessmen are traveling the Pacific now.

To handle this anticipated traffic increase, the airlines have been adding weekly flights as fast as equipment becomes available.

Newest transport going into service in the Pacific is PAA's DC-7C—"Super Seven Clipper," as PAA will call it—on the Mainland-Hawaii route late this month, and on Tokyo and other Orient routes after the first of the year.

PAA forecasts a 20% increase over last year, when a total of 88,547 passengers was carried on Pacific routes in the months of June, July, August and September, according to H. F. Milley, traffic and sales manager for the Pacific-Alaska division.

PAA says that this summer will see the largest volume of Clipper service ever provided Hawaii in the airline's 21 years of flying between the Mainland and the islands. Service between San Francisco and Honolulu has been increased from 15 to 20 flights weekly and between Los Angeles and Honolulu from 11 to 13 flights weekly. Also, 18 extra-section round-trip flights between Pacific coast terminals and Honolulu were provided during June to accommodate vacationers. Nearly all the special flights were set up for weekend periods.

The airline is centering promotions around the introduction, this month, of the "Super Seven Clipper," when flying time to Hawaii will be cut from the 9-10 hr. of the present Boeing Strato Clipper to approximately seven hours. "Super Seven Clippers" will be combination configuration, carrying both tourist and first class passengers on the same plane. With the new airliner, a total of 87,951 seat miles will be available on PAA's Pacific routes during the summer of 1956 as against 63,475 in the same period in 1955.

Full Flights

Northwest Orient Airlines has been running full flights to the Hawaiian Islands earlier than usual this season and predicts a continued high load factor into September.

New transpacific service by Northwest includes:

- **Addition of sixth** flight between Seattle and Tokyo, through to Hong Kong (in conjunction with Hong Kong Airways), inaugurating DC-6B service between Tokyo and Hong Kong. The flight is an all-tourist service.
- **Addition of Super G** Constellation service between Seoul and Tokyo. Two weekly departures now are scheduled from Seoul on through service to the United States via Tokyo.

Five of NWA's six east bound transpacific schedules currently leave from Tokyo for Seattle via an operational stop only at Shemya, on the Aleutians, where the airline reopened an airstrip under a 10-year lease with CAA late last year.

A sixth flight operates via Anchorage, making a direct connection to a schedule operating down Northwest's "inside" route via Edmonton, Canada, to Minneapolis-St. Paul.

NWA is focusing its promotion around tours. During the first half of 1956 NWA carried over 20 group tours to various vacation areas in the Pacific, including Hawaii, Japan, Hong Kong and the Philippine Islands. Its basic tour offering is the "Japan Airventure," a three, five or seven-day independent or escorted tour of Japan. However, the main attraction is the Olympic games around which NWA, in connection with Qantas Airways, organized a "Pacific Olympiad Airventure," including the games and a tour of southwest Pacific and Orient countries.

Offers 'Airventures'

NWA, like PAA, points out that around-the-world air cruises are coming more and more into the limelight. NWA now offers two such "airventures" giving the traveler a choice of first-class or tourist flights.

United Air Lines, serving the Hawaiian Islands from San Francisco and Los Angeles, anticipates a 25% passenger increase over last year's summer months. UAL's well known Honolulu service has approximately 20,000 reservations on file for the 1956 season.

Weekly available seats now total more than 1,600, three-quarters of which are coach accommodations, on flights departing from Los Angeles as well as San Francisco. UAL has found that heavy traffic has warranted second sections to be operated. During June

alone, eight extra round-trip flights left Los Angeles.

Two foreign flag carriers serving the United States on transpacific flights are Qantas Empire Airways and Japan Air Lines.

QEA's service will be increased from three to four weekly flights each way across the Pacific in August, beginning of the Australian airline's busy season. Passengers using QEA transpacific flights (San Francisco via Honolulu, Fiji to Sydney) last year June through December totaled close to 2,000.

This year, during the five-month period starting in August, the airline projects that over 3,800 passengers will be flying this route. Extremely heavy bookings start in August and are expected to continue to the end of the year, Olympic Games traffic accounting for a good portion of the business. The airline's plan for handling the increased games traffic calls for converting, temporarily, two 1049-H Constellations into passenger airliners upon delivery in early fall.

Coinciding with the rapid development and expansion of Japan's industries and the rise of tourism in Japan, Japan Air Lines has grown as an international carrier in the span of two years. At present, JAL is flying four DC-6B weekly roundtrips between San Francisco and Tokyo and predicts at least a 30% passenger increase this year over 1955.

Available seats were increased from 700 to 800 monthly, one way, last May and regardless of the time of the year, the airline says waiting lists are long for all transpacific flights. The traffic has become so constant that the airline maintains there is no real peak season.

Expansions soon to be made include extension of the airline's route to Bangkok. One of the important selling points of the airline, passengers have said, is the Oriental mood travelers feel immediately upon boarding the airplane (Japanese decor, stewardesses in native costume and Oriental music).

Japan Air Lines Flies To Brazil in Tests

Rio de Janeiro—Japan Air Lines DC-6B completed the fourth in a series of Tokyo-Brazil test flights which may precede establishment of regular service between the points. Three more test runs will be made with the last scheduled in March, 1957.

Japan-Brazil service depends on completion of a bilateral agreement between the countries. The flights operate via United States points, and reciprocal rights to serve Japan would go to Real-Aerovias or Varig, the two Brazilian carriers with Civil Aeronautics Board approval to operate into the U. S.

CAB ORDERS

(July 12-18)

GRANTED:

Permission to intervene in the Duluth-Chicago Service Investigation to Eau Claire, Wis.; Saut Sainte Marie, Mich.; Saut Sainte Marie Chamber of Commerce; Hancock, Mich.; Houghton, Mich.; Calumet, Mich.; Chambers of Commerce of Marquette County, Mich.; Ironwood, Mich.; Ironwood Chamber of Commerce, and the County of Gogebic, Mich.

Iowa City, Iowa, Chamber of Commerce permission to intervene in the Seven States Area Investigation.

Tacoma, Wash., Chamber of Commerce, Seattle Chamber of Commerce and Seattle Traffic Assn. permission to intervene in the Northwest Airlines international route permanency case. Petition of the Mayor and City Council of Baltimore the Baltimore Association of Commerce for permission to intervene was dismissed.

Pan American World Airways and Northwest Airlines' motions to withhold oral testimony given in executive session in the reopened Trans-Pacific Certificate Renewal Case from public disclosure. Northwest's appeal from an examiner's ruling was dismissed.

Permission to intervene in the Seven States Area Investigation to the Department of Aeronautics of the State of Nebraska, the South Dakota Aeronautics Commission and the Metropolitan Airport Authority of Rock Island County, Ill.

City and Chamber of Commerce of Atlanta, Ga., permission to intervene in the Puerto Rico Service Case.

Permission to intervene in the Great Lakes-Southeast Service Case to Augusta, Ga.; Buffalo Chamber of Commerce; Dayton, Ohio; Dayton Chamber of Commerce; Chamber of Commerce of Ft. Wayne, Ind., and the County of Summit, Ohio. Petition of the City and County of San Francisco for permission to intervene was denied.

Flying Tiger Line an exemption to perform two charter flights from Brussels and Athens to New York pursuant to a contract with the Intergovernmental Committee on European Migration.

APPROVED:

Agreements involving American Airlines, Mohawk Airlines and various other carriers relating to intercarrier arrangements.

ORDERED:

Investigation of a round-trip tourist excursion fare for military personnel traveling between Okinawa and Hong Kong proposed by Northwest Airlines and Hong Kong Airways.

DISMISSED:

W. T. C. Air Freight's petition for permission to intervene in the Air Freight Forwarder Investigation.

Air Transport Associates' complaints against certain tariffs issued by Pan American World Airways and Alaska Airlines.

Transportes Aeros Nacionales' complaint against certain freight rates between Miami and Central American points at the request of the airline.

DENIED:

Seaboard and Western Airlines' application for an exemption to provide free transportation to S. M. Schusheim and J. Kreiness of S. M. S. Instrument Sales and Service and S. M. S. Industries, Inc.

United States Overseas Airlines' application to operate transatlantic coach service between Frankfurt and Paris and New York for military personnel and their families and civilian employes of the Defense Department or other government agencies in Europe traveling on official furlough or leave.

Seaboard and Western Airlines' application to add Burtonwood Air Force Base, England, and Deols Air Base, France, to its service pattern.

Shortlines

► **American Airlines** flew 751,083 passengers 489,668,000 passenger-miles in June, an increase of 17.8% over the 415,700,000 passenger-miles flown in June, 1955.

► **Babb Co.**, of Phoenix, Ariz., purchased four Convair 240 transports from Linee Aeree Italiane.

► **British Overseas Airways Corp.** reorganized its London sales organization to create regional sales managers for the United Kingdom, Europe, the Americas, Middle East and Africa and the Far East. George A. Boughton has been appointed sales manager of the Americas; his territory includes the United States, Canada, Central and South America, the Caribbean, the Bahamas and Bermuda.

► **Emery Air Freight Corp.** established supplementary International Gateway Service at Los Angeles, San Francisco, Seattle, New Orleans and Miami to expedite international traffic. Emery has just opened new offices in Miami and New Orleans.

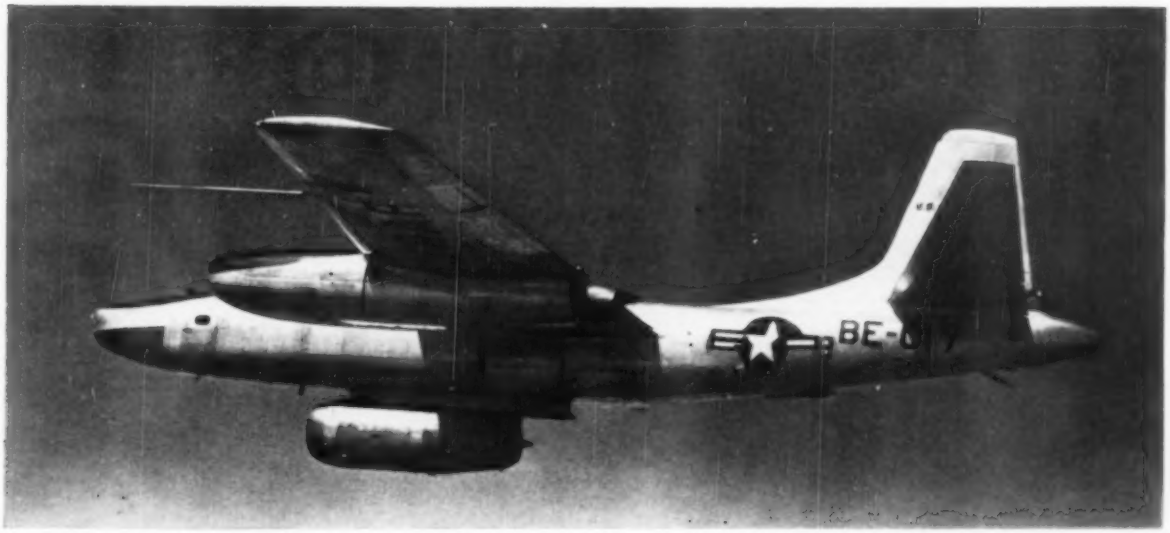
► **Seattle-Tacoma International Airport** handled 132,054 passengers in June, an increase of 15,691 over June of 1955.

► **Slick Airways** flew 4,482,000 ton-miles of freight in May and 24,709,000 ton-miles of freight in the first five months of the year, gains of 26% and 47% respectively over the same period of 1955.

► **Southwest Airways** inaugurated a new coach service among nine California cities this month. Fares are about 23% below first-class fares.

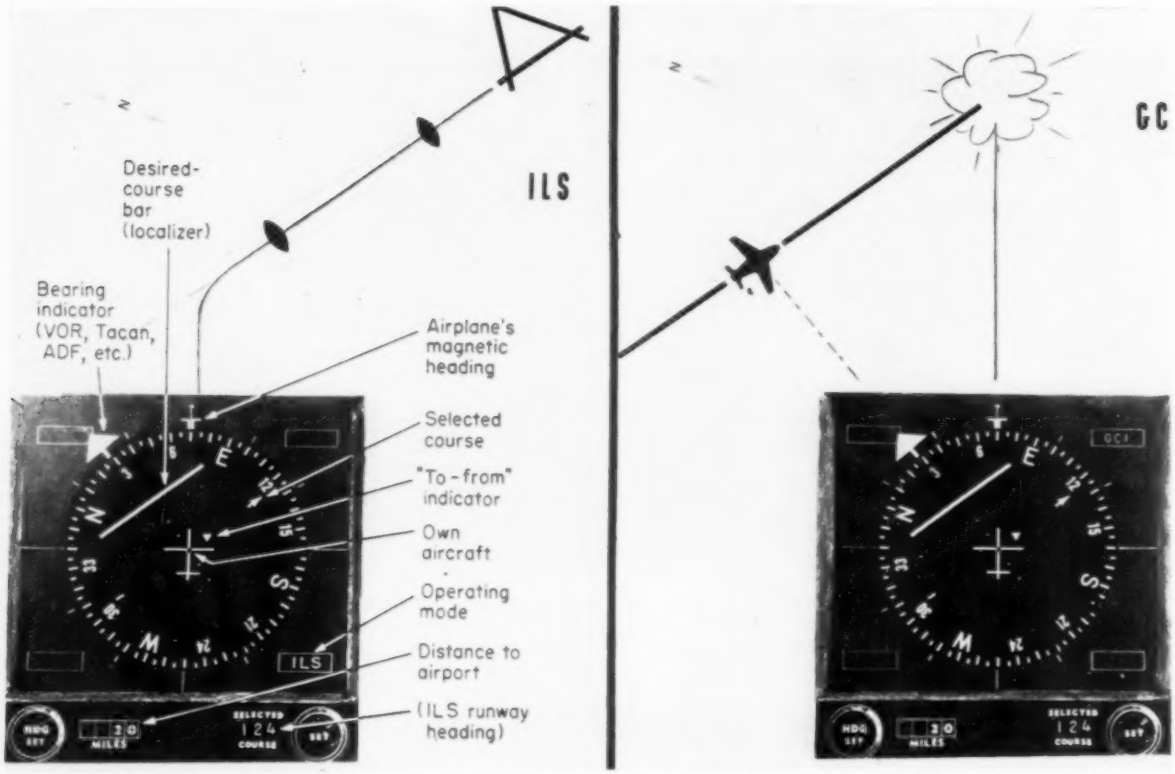
► **Trans World Airlines** will add a New York-Los Angeles nonstop, round-trip flight to its schedules August 1 when it puts two new Super-G Constellations into service.

B-45 Takes J75 Aloft, B-47 to Test Iroquois



Pratt & Whitney Aircraft axial-flow J75 turbojet engine rated at 15,000 lb. thrust is undergoing extensive flight testing on a North American B-45 medium bomber. B-45 was modified to accommodate the engine in a retractable pod in bomb bay. J75 flying test bed follows a series of other test-bed configurations that have been extensively flown by Pratt & Whitney. First used as an expedient, flying test-bed program now is thoroughly integrated part of company engineering development program.

B-47 test bed for Orenda Iroquois engine uses unique side-mounted pod for installation of test engine. The B-47 is the only airplane available which can provide the necessary test facilities and fly at the altitudes which will be operational for the Iroquois. Avro-Canada is considering the Iroquois for installation in its CF-105 delta-winged, supersonic all-weather fighter. USAF loaned the B-47 to the RCAF for experimental purposes. Installation of the Iroquois under the starboard horizontal stabilizer will require that the starboard three wing-mounted J47s be throttled down during tests to keep the airplane trimmed. The test pod is being installed by Canadair Ltd. The picture is a Canadair artist's conception.



NEW USAF downward looking instrument can display variety of different navigation problems, including ILS approach (left) and GCI intercept (right). Configuration, one of several under consideration, displays information normally shown on four or more instruments.

Instrument Design, Part II:

USAF Goal: More Data, Fewer Instruments

By Philip J. Klass

Dayton—USAF's ambitious new look in cockpit instrumentation aims to eliminate 25% of the instruments a pilot must scan, yet provide more information in a form much easier to assimilate (AW July 23, p. 62).

To accomplish this, the Wright Air Development Center's Flight Control-Display Integrating Working Group has launched a basic study into just what information a pilot needs and how this information can most naturally be integrated and displayed.

Basic Categories

Take navigation information, which is displayed in bits and pieces on half a dozen different instruments. USAF studies showed that all navigation information falls into one of the following basic categories:

- **Displacement** from a desired course.
- **Bearing** indication to a known position, either fixed or moving.

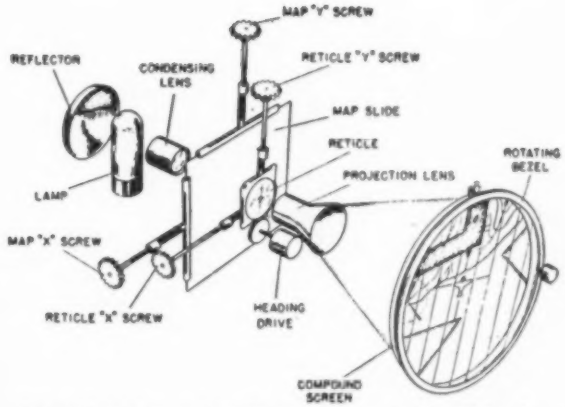
When reduced to these fundamentals, it became apparent that even the most complex military navigational problem could be presented and solved as a triangulation problem. This has led to a single integrated symbolic horizontal situation display to combine the information now presented on four or more individual instruments. The single horizontal situation display, which bears a close resemblance to instruments developed earlier by Collins Radio and Sperry Gyro, will replace:

- **Radio magnetic** indicator (RMI).
- **Vertical pointer** of ID-249 cross-pointer indicator, which now displays Tacan, VOR, or localizer on-course information.
- **Tacan/DME** type distance indicator.
- **Gyro compass** (magnetic heading).
- **Data link** command indicator.

Collins and Sperry are developing slightly different versions of the new horizontal situation display and its associated computer for WADC evaluation next spring.

To visualize the versatility of the proposed downward look display, consider an ILS (instrument) approach and a GCI (ground controlled intercept) problem. (See photos, above.) The miniature skeleton airplane at the center of the instrument represents own ship, and the moving compass card shows the plane's magnetic heading, both relative to the skeleton airplane and a top lubber line or index.

- **Instrument approach:** The white (course) bar corresponds symbolically to the position of the ILS localizer beam relative to the aircraft. The bearing pointer (white arrow) along the periphery shows the bearing to a Tacan, VOR, or other ground aid. Distance to the runway is displayed in digital fashion in the small window. As the aircraft approaches the localizer beam, the white bar moves closer to the miniature airplane on the dial. When the pilot turns onto the localizer, the white bar aligns itself with the miniature airplane's fore-aft axis. Thereafter any deviation of the airplane from localizer beam will cause the bar to



AIRPLANE position and heading relative to terrain will be shown on aeronautical charts display by projection or closed-circuit TV techniques on small cockpit instrument shown. Movement of airplane relative to terrain will cause movement of aeronautical chart relative to miniature airplane, operating from signals generated by an automatic dead reckoning computer or other navigation aid. Chart is reproduced from slide.

displace itself to the left or right.

• **Ground controlled intercept:** For a GCI problem, the bearing indicator (white arrow) points to the target, actuated by signals transmitted via data link from a ground radar-computer. The white course bar displays the target's track, with the bar moving toward the miniature airplane as the point of interception is neared.

Crosshair Display

When this horizontal situation display is mounted underneath the previously described vertical situation display (AW July 23, p. 62), as shown at right, the planned interrelation between the two becomes apparent. In addition to the previously described horizontal-line association of all instruments displaying information affected by changes in airplane pitch angle, there is a corresponding vertical-line association between the turn-steering needle on the pitch and bank display, the needle and ball turn indicator, the magnetic heading card, and the fore-aft axis of the miniature airplane on the plan position indicator.

When the airplane is making good the steering commands called for by the flight director, fire control system, or GCI, the vertical steering needle will be aligned with the line passing down through the plane's magnetic heading indication and the miniature airplane on the lower instrument.

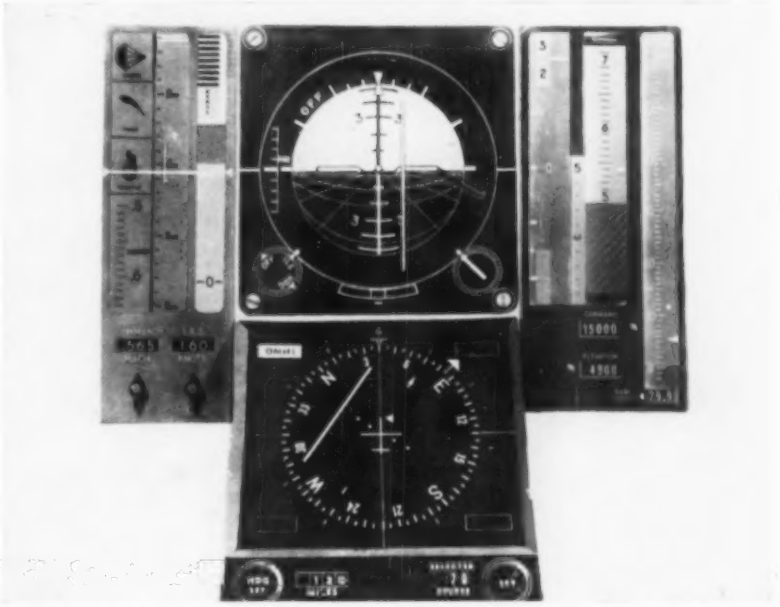
(This gives what Capt. R. C. Robson, in his June 4 column in AVIATION WEEK called a natural crosshair system with attitude-type displays in a horizontal row, navigation instruments aligned vertically. Robson reported that several airline pilot groups have recommended such a layout for the new jetliners.)

Chart Display

As part of its integrated instrumentation program, WADC is investigating techniques for displaying airplane position and heading relative to navigation charts to supplement for some applications the symbolic horizontal situation display. The pilot, at present aircraft speeds hardly has time to unfold a navigation chart before he has outflown its coverage and must reach for another. Besides there is the problem of storing and handling charts in a crowded cockpit.

Two types of map displays are under investigation:

• **Optical projection system.** A small portion of a large-area map is optically



INTEGRATED horizontal-vertical lines of reference result from new USAF panel layout.

projected in color from a small glass slide onto a 7 or 10 in. diameter screen of a cockpit indicator. A 3 x 4 in. glass slide can accommodate a map of the entire U. S. The slide is servo-driven so that any desired portion of the map can be projected with two or more degrees of magnification for close-up or large area scrutiny.

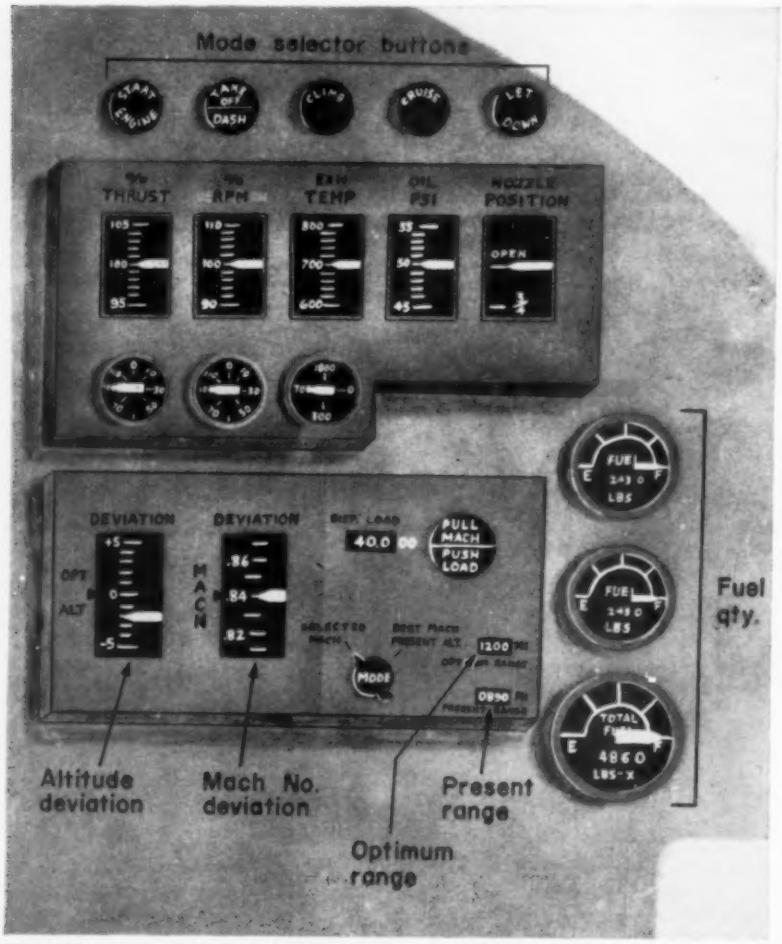
Superimposed on the projected chart is a miniature airplane and grid whose heading relative to the chart is continuously and automatically controlled to reflect the heading of the actual airplane. (See photo, p. 49.) Movement of the airplane along its flight path, as established by a dead reckoning computor or other navigation device, will cause movement of the indicator's miniature airplane relative to the chart.

A prototype model which Avion is building for WADC evaluation will permit either movement of the miniature airplane over a fixed chart or movement of the chart under a fixed miniature airplane to enable WADC to determine which type presentation is superior.

- **Closed circuit TV system.**

Here the glass slide of the chart is projected optically onto a small TV camera instead of directly onto a cockpit indicator. The TV camera will in turn feed a cathode ray tube type indicator. This permits the map to be displayed on the same CRT used to display radar fire control and navigation information, superimposing radar and chart information where desired. Another advantage is that the projection system can be located away from the crowded cockpit. Disadvantages are the added weight and black and white presentation. Avion, which also is developing a TV map display system, estimates that in production the system would weigh no more than 45 lb. A prototype is scheduled for early delivery for evaluation by WADC's Weapons Guidance Laboratory.

WADC has broken down the prob-



NEW USAF power plant display under consideration employs five basic instruments with moveable scales which are automatically positioned to desired range of values for any particular flight mode. Pilot then adjusts controls to keep all pointers centered on scales. Deviation from optimum cruise altitude or Mach number is shown on lower instruments.

AVRO AIRCRAFT

offers opportunities for these people— with or without aeronautical experience:

Mathematicians • Computer Programmers • Aerodynamicists • Metallurgical Technicians • Stress Engineers • Systems Engineers • Mechanical Engineers • Flight Test Engineers • Controls Engineers • Aero Thermodynamicists • Vibration & Flutter Engineers • Civil Engineers for: Structural Analysis, tests, Design • Computing Specialists • Draftsmen & Technicians

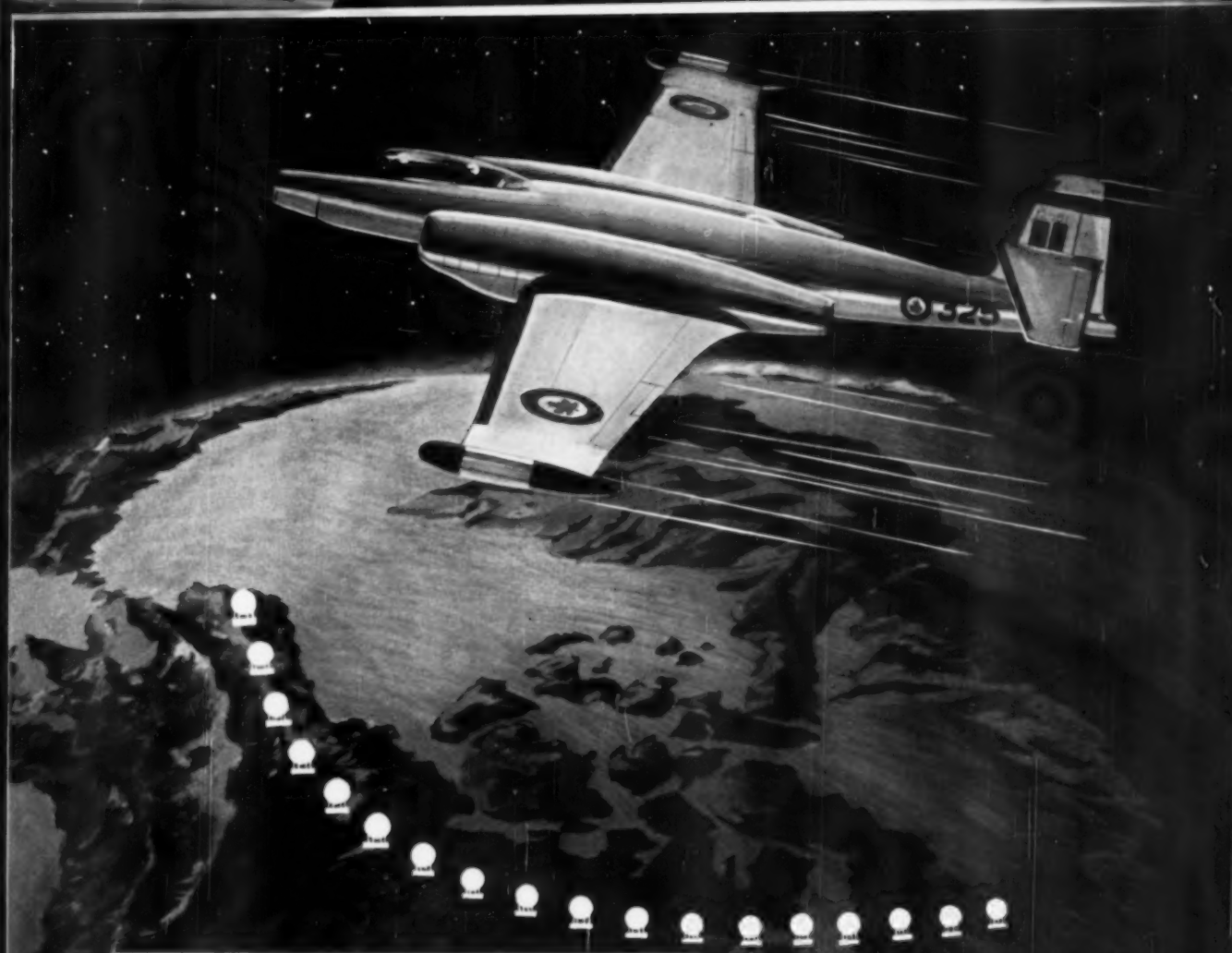
Avro Aircraft's broad and diversified range of advanced aeronautical design projects gives engineering people unexcelled opportunities to utilize individual ingenuity, initiative, imagination and creative qualities.

All aspects of Engineering at Avro employ the most up-to-date scientific techniques and modern facilities. These are under the guidance of some of the world's finest engineering talent. As members of a progressive design team, more concentrated job responsibility means more recognition for individual ideas and accomplishments.

You who are interested in responsible work now, on design concepts which represent the most advanced state of your art, should

Write today to:
EMPLOYMENT MANAGER,
AVRO AIRCRAFT LIMITED,
BOX 4004, TERMINAL 'A',
TORONTO, CANADA

AVRO AIRCRAFT



RADAR NETWORK PERFORMER

The AVRO CF-100, with its superior armament, search and fire control system is the most potent aerial defender operating with the North American continent's Distant Early Warning and other Radar defenses.

Continuous development of the AVRO CF-100 through nine variants indicates its capabilities and versatility.

The current rocket-firing Mark 5 is providing improved bomber interception performance at higher altitude.

CF-100's will start augmenting RCAF NATO squadrons in Europe this year to help meet that Continent's night-fighter, all-weather defense requirements.

AVRO AIRCRAFT LIMITED

MALTON, CANADA

MEMBER: A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP

ROLLI-TANKER by Goodyear being towed away to construction site after being filled from collapsible PILLOW TANK brought in by truck. Each Rolli-Tanker holds 250 gallons of gasoline. Pillow Tanks by Goodyear have capacities up to 10,000 gallons, while "pillow" weighs only 700 pounds!

Meeting the challenge

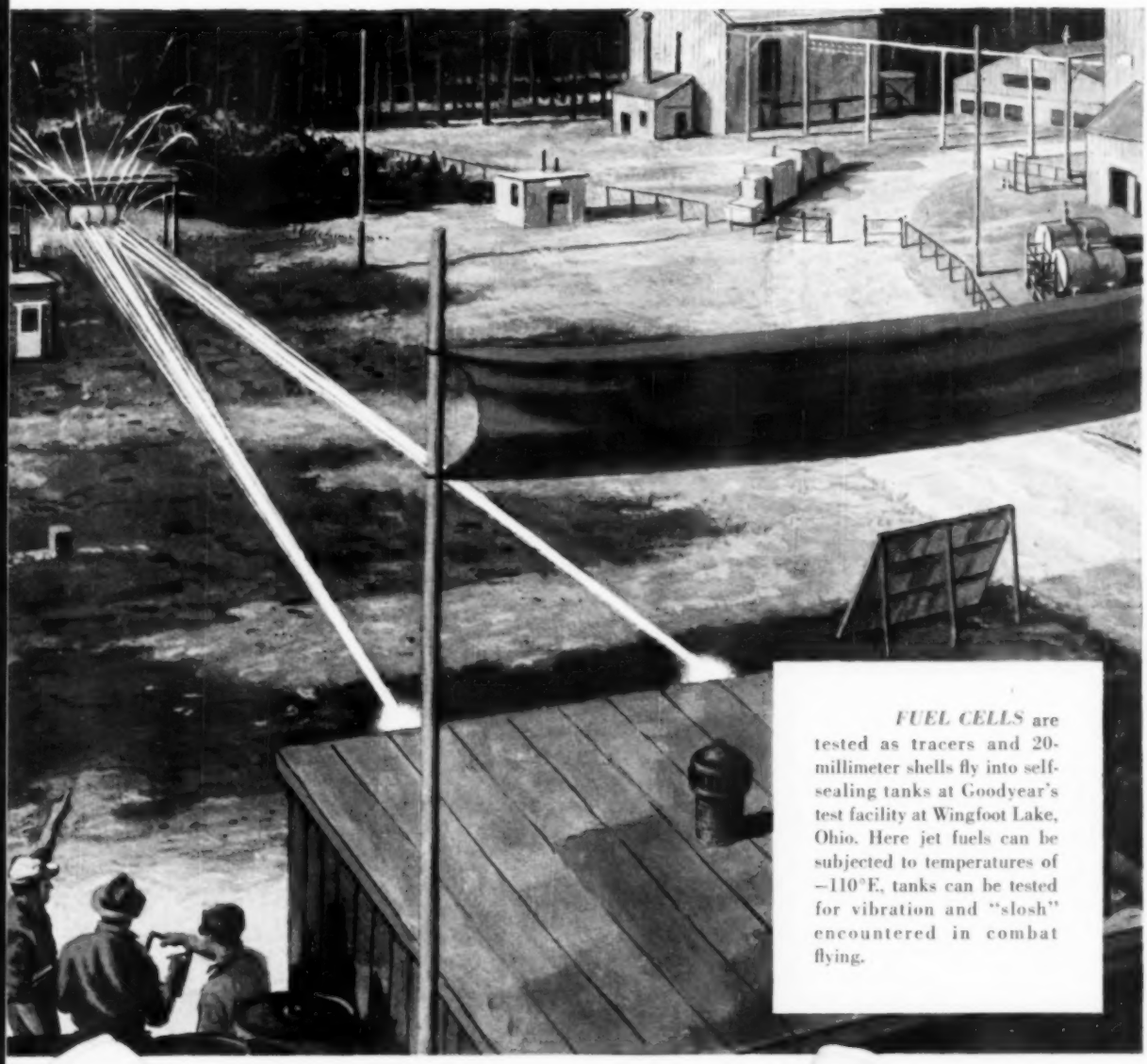
How Goodyear is finding new ways of keeping inflammable liquids on the move and under control—in the service of Aviation, Industry and Defense

The challenge of handling explosive-prone liquids is one Goodyear met in 1920, when it developed the first successful bullet-sealing fuel tank for airplanes.

Since that time it has delivered a host of advancements to meet the needs required of handling new fuels for new uses.

Foremost among these have been new systems for supplying highly hazardous propellants to missiles and rockets, new means for transporting and supplying gasoline to farms and remote construction sites, new collapsible cells for stowing fuel within the thin wings of jet aircraft.

Today this pioneering continues with full vigor as the Aviation Products Division of Goodyear uncovers new ways to provide foolproof fuel systems for military vehicles, torpedo boats and high-flying jet aircraft—new concepts for delivering inflammable liquids where they are needed with maximum safety and economy.



FUEL CELLS are tested as tracers and 20-millimeter shells fly into self-sealing tanks at Goodyear's test facility at Wingfoot Lake, Ohio. Here jet fuels can be subjected to temperatures of −110°E, tanks can be tested for vibration and "slosh" encountered in combat flying.

# of handling fuels

The facilities for this research and development, in Akron and Los Angeles, represent a vast investment—the key to unlocking knotty problems concerning the adverse effects by vibrations, extreme temperatures and other hazards on new and complex fuel handling problems.

It could well be that the experience of the men who man these facilities *could advance the completion dates of your project by months*—if your problem is fuels and their handling. For information, write:
Goodyear, Aviation Products Division, Akron 16, Ohio, or Los Angeles 54, California.

GOODYEAR
AVIATION PRODUCTS

Rolli-Tanker—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

What's special about these couplings?

Look at the newest couplings for jet aircraft bleed air ductwork! Connect them, disconnect them—again and again—they remain tight and dependable. Trouble-free performance is a result of metal to metal seal, with no secondary sealing devices or compounds. No loose parts to get lost or damaged.

Janitrol couplings save up to 40% in weight over conventional designs, yet they're designed for continuous use at 250 psi at 750° F. To make installation easy, clamp tightens on latching side; quick connects and disconnects can be made in hard-to-reach locations! Lock nut torque is only 35 in. lbs.

They withstand corrosion, pressures, temperatures, surges, misalignment, and vibration. Maximum design leakage is .01 cfm per inch of duct diameter.

Seven sizes available now, from 1½" to 4"; special sizes and designs made to order.

Janitrol *aircraft* couplings are a product of experience in aircraft air handling dating back to World War II. For full details and specification data write or phone your nearest Janitrol representative.

Janitrol Aircraft-Automotive Division, Surface Combustion Corporation, Columbus 16, Ohio . . . District Engineering Offices: Washington, D. C., Philadelphia, Columbus, Ft. Worth, Hollywood.

COMBUSTION SYSTEMS · HEAT EXCHANGERS · PNEUMATIC CONTROLS

Janitrol

lem of displaying powerplant information into three categories of instrumentation:

- **Power group,** consisting of percent thrust, percent rpm.; exhaust temperature; oil pressure and nozzle position setting.
- **Cruise control,** for indicating optimum altitude or Mach number for greatest range or endurance.
- **Fuel management,** showing fuel remaining.

For power group functions, it is desirable to show the pilot his actual engine conditions and the desired, or optimum, values. The display of these two parameters is made more difficult because the optimum value will change with different operating modes during a mission.

Powerplant Display

To display power group functions, WADC plans to use rectangular instruments. A moving pointer will show actual performance. (See sketch, p. 50.) However the scale against which this pointer works will itself be movable. This scale will be automatically set for the proper range of values during each phase of a mission: engine start, take-off, climb, cruise, and letdown. (In prototype models, the modes, will be selected manually by means of push buttons.)

When all five powerplant parameters are at their desired values, all five pointers will be aligned in a horizontal string. Deviation of any one pointer from this horizontal string will alert the pilot that something is wrong.

Signals to set the instrument scales will come from automatic computers. Two experimental engine data computers are now under development for WADC by General Electric's Aircraft Instrument Department and Sperry Gyro.

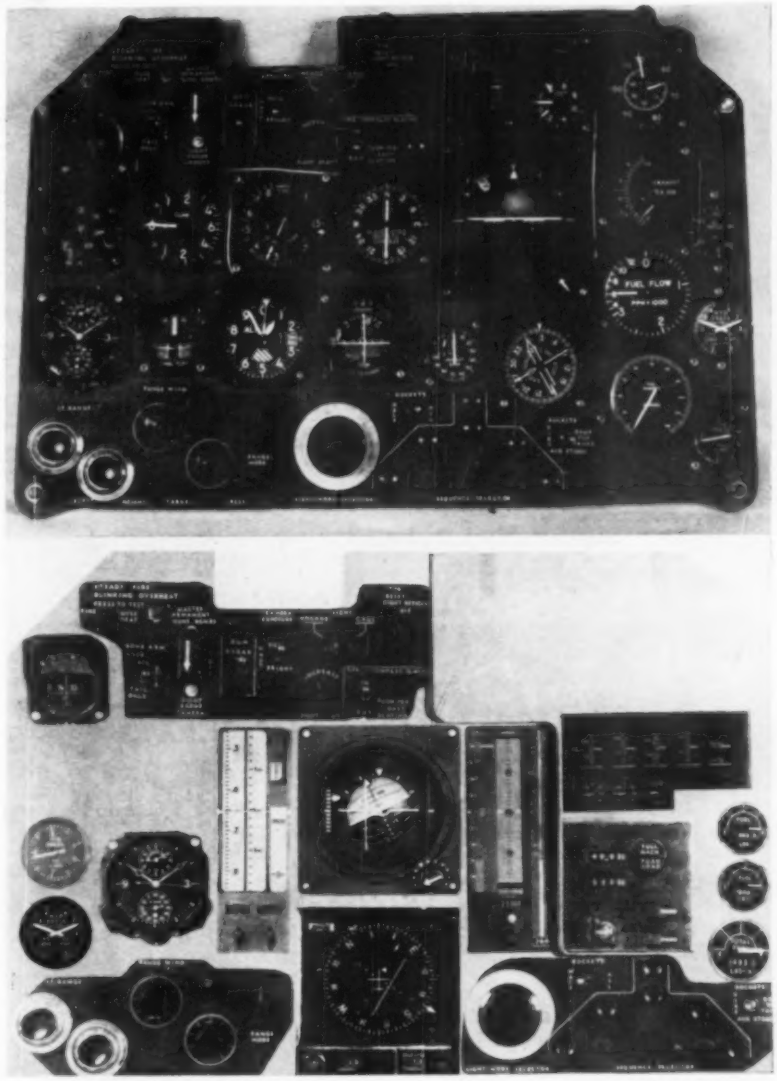
Underneath the rectangular instruments, WADC proposes to mount three small circular gross-scale indicators to show percent thrust, rpm., and exhaust temperature. In addition to giving the pilot trend type information, the small circular instruments will serve as standby units in the event of failures of the servo-driven precision indicators.

WADC has let contracts to Norden-Ketay and Weston to develop the new engine instruments.

A computer under development by John Oster Manufacturing Co. will calculate optimum altitude or Mach number for obtaining maximum range in jet aircraft. (AW April 9, p. 51.) The computer's output will be displayed on two rectangular instruments mounted below the power group. (See photo, p. 50.)

Optimum range can be obtained under either of two conditions:

- **Varying altitude** while maintaining constant Mach number, or . . .
- **Varying Mach number** while holding constant altitude.



SPACE SAVING in crowded cockpit panel is major advantage of new USAF instruments. Top photo shows conventional panel of new USAF fighter-bomber. Below it is shown same panel with substitution of new instruments for old, increasing available space by 30%. Photo shows need for redesign of conventional switches, controls (left) for space gain.

Mode of Operation

The pilot will select the desired mode of operation, then get an indication of his deviation from the desired altitude or Mach number by means of a moving pointer.

The pilot can set in the airplane's disposable load (bombs, rockets, etc.) from which the computer will calculate the maximum possible range (if load were released) and the range based on current operating conditions. Both will be shown on small digital counters. If the present range figure shows the pilot can not reach his target, he may decide to dispose of part of his bomb load to extend his range.

Small circular instruments, containing pointer and digital-counter type indicators, will display fuel quantity remaining in individual tanks and the collective total.

Other Goals

Although WADC's primary emphasis has been directed toward integrating flight and powerplant instruments, it plans to attack other miscellaneous cockpit display problems, including time functions, as time-to-go to interception, to target, to landing, together with a variety of weapon readiness and control functions.

WADC personnel emphasize that

58, is available at 40 cents per copy.

Almost every modern airplane relies on Koehler quality

. . . in fuel level control valves

For inflight refueling and fuel transfer applications.

. . . in filters and strainers

For the fuel, water and oil systems of most advanced modern aircraft.

. . . or in drain valves

A wide range of ball or poppet types engineered to individual fluid or application requirements.

Koehler, a pioneer in aircraft valves, filters and strainers exclusively, manufactures nearly 500 different aircraft products. Its affiliation with The New Britain Machine Company greatly expands Koehler facilities. Your inquiry and prints will receive prompt attention. Koehler Aircraft Products Company, Dayton, Ohio.

KOEHLER

Aircraft Products Company

A Subsidiary of The New Britain Machine Company

AIRCRAFT TUBING

GOVERNMENT SPECIFICATION TUBING IN STOCK..

- A.I.S.I. 4130.....MIL-T-6736
- A.I.S.I. 4130.....AN-T-69
- A.I.S.I. X-4130.....AN-WW-T-850A
- A.I.S.I. 1025.....AN-WW-T-846

SERVICE STEEL • DETROIT, MICHIGAN LOS ANGELES, CALIFORNIA

the instrument configurations illustrated are experimental. Simulator and flight tests during the coming year may dictate changes. However, to give a graphic demonstration of the space-saving possibilities, WADC has superimposed cardboard mock-ups of the new instruments over the cockpit panel of a USAF fighter-bomber. Result: 30% space saving. (See photos, p. 55.)

It also illustrates wasteful space utilization in the unchanged portions of the panel.

Of equal importance, from a human engineering viewpoint, is that two basic integrated frames of reference, one horizontal and one vertical, would replace a conglomeration of individual frames of reference.

Flight information would be presented to the pilot in terms of actual and desired performance, relieving the pilot of much integration, interpretation and conversion of flight data he must now perform.

Moving Tape

Readability of instruments will be enhanced by the use of moving tape scales which can provide any required degree of accuracy, sensitivity, and range-of-values for any particular type aircraft.

From the standpoint of use, individual portions of the integrated display can be substituted for existing instrument groups without waiting for availability of the entire panel display.

The integrated display program has evoked tremendous interest and enthusiasm among both airframe and instrument company engineers, according to David Stockman, chief of WADC's Instrument Branch, Flight Control Laboratory. Instrument designers, whose initiative has long been constrained by the requirement that any new instrument follow the basic configuration of its predecessor, can now unharness their design ingenuity.

FILTER CENTER

▶ **Standardized MTI**—Recent gains in moving target indicator performance and reliability may lead Rome Air Development Center to standardize on one or two designs, provide MTI as government furnished equipment to its radar contractors.

▶ **New RTCA Standards**—Minimum performance standards for airborne radio receiving and direction finding equipment operating in the 200-415 kc. band, prepared by Radio Technical Commission for Aeronautics, is now available in a 42-page report. The report, identified as Paper 83-56/DO-70, prepared by RTCA Special Committee

58, is available at 40 cents per copy. RTCA's address: Room 2036, Bldg. T-5, 16th & Constitution Ave., N. W., Washington 25, D. C.

▶ **Looking For Business?**—Rome Air Development Center is seeking additional potential contractors for its source files. Of 4,000 companies in the electronics field, only 500-600 have registered. If your firm is interested, but not listed, contact Lt. R. D. Hynes, Unit RCBS, Rome Air Development Center, Rome, N. Y.

▶ **New Telemetry Band?**—Congestion is becoming so bad in the present 215-235 mc. telemetry band that the USAF is seriously thinking of moving to a new band in the 1,000 to 2,000 mc. region.

▶ **Tacan Data Link**—AN/ARN-26 is the designation of the airborne Tacan receiver which incorporates added provisions of air-to-ground data link for automatically transmitting information on aircraft bearing, altitude, distance.

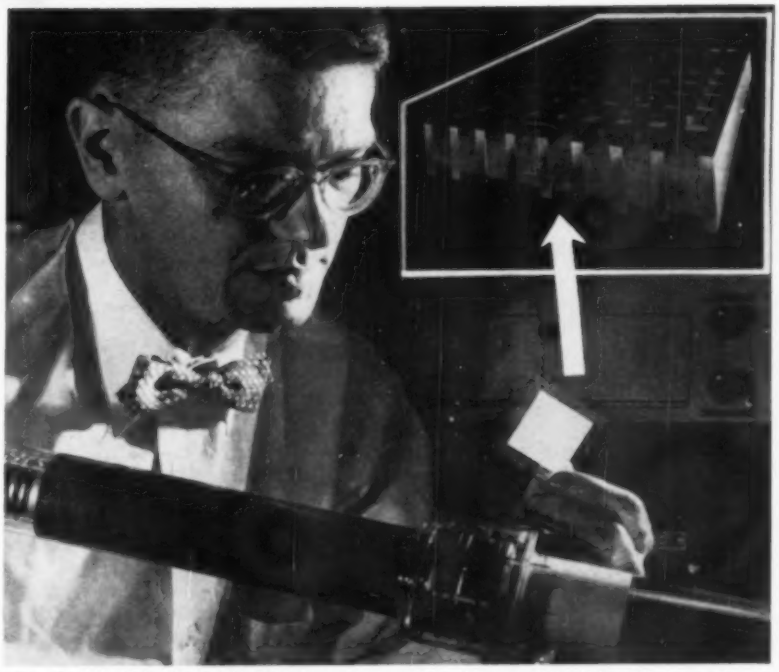
▶ **Too Many R & D Dollars?**—Defense Department may be impeding progress on important projects because R & D funds exceed supply of qualified technical manpower. This possibility was voiced recently by Dr. Irving Wolff, vice president-research of Radio Corporation of America, speaking at the Conference on Industrial Research. Dr. Wolff recommended that the Defense Department establish long-term priorities for its R & D projects, cull out low priority programs to prevent siphoning off of limited manpower.

▶ **"Avionics Week"**—Mayor Thomas D'Alesandro, Jr., of Baltimore has proclaimed the week beginning October 29 as "Airborne Electronics Week" in Baltimore. This coincides with the third annual East Coast Conference on Aeronautical and Navigational Electronics to be held there Oct. 29-30.

Device Stores Million Bits of Information

A new miniature high-capacity computer "memory," capable of storing nearly a million bits of information on a honeycomb element only one inch square, has been developed by General Electric's research laboratory. The novel honeycomb element is the heart of a cathode-ray tube type information storage device that employs familiar electron beam writing and read-out techniques.

The tiny storage element upon which information is stored consists of a thin glass sheet in which small holes have been etched and filled with small metal plugs. When the electron beam is trained on a metal plug, it builds up a charge between this plug and conducting layers deposited on both surfaces of the glass. (See photo, above.)



NEW GE COMPUTER "MEMORY" tube can store nearly one million bits of information on tiny glass honeycomb (insert) consisting of 250,000 holes filled with metal plugs.

GE reports it can etch 500 holes per inch, giving 250,000 individual storage cells per square inch. Because each cell can recognize at least 10 different levels of writing beam intensity, total cell capacity can be increased to more than 800,000 bits. (250,000 times the log to the base 2 of 10).

The honeycomb construction technique provides glass insulating barriers between adjacent cells which reportedly solves the problem of leakage or "smearing" between adjoining cells in previous tubes.

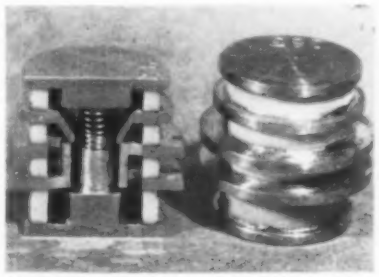
The technique, developed by GE's Dr. Harold R. Day, also eliminates problems of registration and provides an extremely rugged structure, making it suitable for airborne use. GE suggests that its new storage tube could be used in radars to provide TV-type bright displays or to permit coversion of radar data for narrow bandwidth transmission.

GE Develops Voltage Tunable Magnetron

A new voltage tunable magnetron, whose frequency can be varied over a 2:1 range and which has a control electrode that permits amplitude or pulse modulation, has been developed by General Electric. The tube should find use in countermeasures, radar altimeters, FM communications and test equipment.

GE is tooling up to produce a line of the new tunable magnetrons for the ultra high frequency band, and expects to apply the same techniques to tubes for the super high frequency region.

In the new tube, developed by GE's Research Laboratory under Signal Corps sponsorship, variations of anode voltage produce practically instantaneous and linear changes in tube frequency, GE says. The tube's new type of grid control and electron injection reportedly climinates the requirement for careful regulation of cathode temperature in earlier voltage-tunable magnetrons. The tube employs a novel cathode design in which the emitter is placed outside the RF section of the tube. This reportedly reduces the detrimental effects of back bombardment to give longer life and better reliability.



VOLTAGE-TUNABLE magnetron, in both cutaway and laboratory version, is made of metal and ceramic disks and is only about one-half inch high.

Expansions, Changes In Avionics Industry

Hughes Aircraft Co. has purchased the Santa Barbara (Calif.) Research Center, its first such acquisition. The new addition, which is active in infrared research, will continue in its present location.

Other recently announced expansions, mergers and changes in the avionics industry include:

• **AC Spark Plug Division** of General Motors has started construction of a new 225,000 sq. ft. plant near Milwaukee's General Mitchell Airport to be used for defense electronic production. The new plant will increase AC's total floor space to nearly a million square feet.

• **International Business Machines Corp.** will build a new 150,000 sq. ft. laboratory at Kingston, N. Y. for its Military Products Division, starting later this year.

• **Consolidated Electrodynamics Corp.,** Pasadena, Calif., has acquired Electronic Industries, Inc., of Burbank. The new acquisition, which specializes in etched circuitry, will become a CEC subsidiary, but will retain its present name and activity. H. F. Colvin, CEC president, also is president of the new subsidiary; George B. Clark becomes v.p. and general manager.

• **Synthetic Mica Corp.,** Caldwell Township, N. J., will build new addition to its Research Development Center, doubling present floorspace.

• **Farnsworth Electronics Co.,** a division of International Telephone & Telegraph Corp., has formed a Pacific Division following acquisition of Bennett Products Manufacturing Co. of Palo Alto, Calif.

The new division will continue production of hermetic seals, switches and connectors and also will serve as base for expansion of Farnsworth's light electronic component production and instrumentation. Vinton D. Carver has been named v.p. and general manager of the Pacific Div.

• **Hycon Eastern, Inc.,** Cambridge, Mass., has acquired 7,000 sq. ft. of additional production space and reports that it expects to add another 11,000 ft. shortly for production of crystal filters.

• **Telemeter Magnetics, Inc.,** Los Angeles, has moved to new quarters at 2245 Pontius Ave., which will give company 24,000 sq. ft. of facility when new addition is completed in October.

Printed Circuit Kit

Printed circuit do-it-yourself kit contains all materials for making etched circuit boards in 30 minutes. Kit includes drawing pen and etch resistant ink, etching powder, 10 copper-laminated sheets, 10 most popular tube sockets and etching tray. Photocircuits Corp., Glen Cove, New York.

• **BJ Electronics** has moved its four Pasadena, Calif. plants to new location on Newport Ave., Santa Ana, Calif.

• **Electric Regulator Corp.,** Norwalk, Conn., has acquired the regulator business formerly handled by Burlington Instrument Co., purchased by Texas Instruments, Inc. earlier this year. ERC will immediately start producing the "Synchrostat" voltage regulator originally manufactured by Burlington.

• **Cal-Tronics Corp.,** Los Angeles, maker of electronic test equipment has formed a new division to be known as Foto-Etch Circuits. New company will develop and produce printed circuits on prototype and production basis. W. G. Weigel is named general manager. Foto-Etch Circuits' address: 2631 Southwest Drive, Los Angeles.

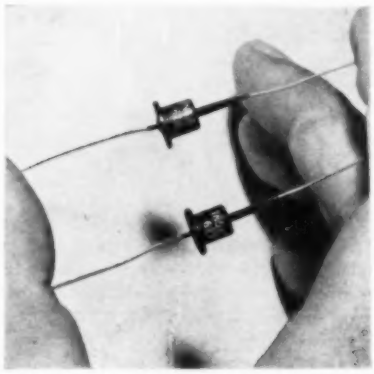
• **Stromberg-Carlson,** division of General Dynamics Corp., has formed new Electro-Acoustics Research Group for work in the field of underwater sound, ultrasonics, and application of information theory to analysis of speech sounds. Frank H. Slaymaker, former chief engineer of the Special Products Div., will head new group.

NEW AVIONIC PRODUCTS

Semiconductors:

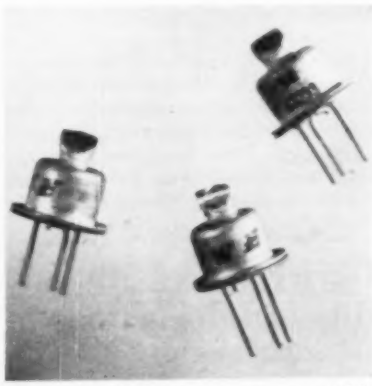
• **Miniature silicon rectifiers,** Type TJ-A, are available with peak inverse voltage ratings from 50 to 400 v., with maximum forward current ratings of 200 ma. at 150C. Complete specifications are available in Bulletin TE-1351. Manufacturer also announces TL series of silicon rectifier stacks, with voltage ratings up to 5,100 v. rms and current ratings up to 10 amps. Units are available for single, three, or six-phase power supply circuits. Bulletin TE-1342 gives application data. Transitron Electronic Corp., Melrose 76, Mass.

• **Miniature silicon rectifiers,** Types 1N537 and 1N538, hermetically sealed with axial leads, are rated for 250 ma. at 150C, but can deliver up to 750



ma. at lower temperatures. Maximum leakage is 0.5 ma. over temperature range of −65 to 150C. The 1N537 is rated for peak inverse voltage of 100 v., while the 1N538 is rated at 200 v. General Electric Co., Semiconductor Products Dept., Syracuse, N. Y.

• **High frequency germanium** transistors, diffused base type GA-53233, with alpha cut-off frequencies of 400 to 600 mc. and power dissipation ratings of



150 mw. at 25C, are now available from Western Electric Co., Electronics Products Dept., Radio Div., 120 Broadway, New York 5, N. Y.

• **Germanium transistor,** P-N-P junction Type 2N200, has common emitter current gain of 45, can dissipate up to 350 mw. at 75C. Bulletin TE-1320 gives application data. Transitron Electronic Corp., Melrose 76, Mass.

• **High power silicon rectifier,** rated 100 amps, 200 volts, weighs only 5 lb. and

occupies ¼ cu. ft. Unit will handle 20 kw. with an efficiency better than 98%, according to manufacturer. Bogue Electric Mfg. Co., 52 Iowa Ave., Paterson 3, N. J.

Components & Devices

• **High temperature precision potentiometers,** rated for operation over temperature range of −55 to 150, 175 or 225C, are announced by Fairchild Controls Corp. New line includes wirewound pots in both single and multiturn types rated for continuous duty, ¾ to 4 watts at 125C, with derating at 150C. Also included are metal film rotary and trimmer pots for use at 150C, 175C, and 225C. For further information write Fairchild Controls Corp., Components Div., 225 Park Ave., Hicksville, N. Y.

• **High temperature precision pot,** Model 875T, rated to 200C, measures ⅝ in. dia., has linearity of 0.5% or better and resolution as high as 0.06%. Unit is rated 2 watts at 150C, with

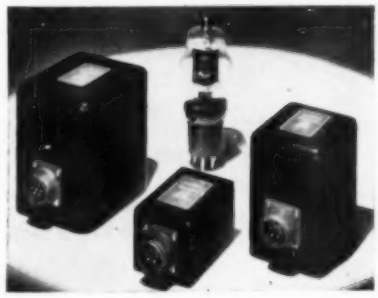
derating above. Pot can be supplied with taps and up to six ganged sections are available. G. M. Giannini & Co., Inc., Electromechanical Div., 918 East Green St., Pasadena 1, Calif.

• **Silicon power rectifiers,** available in nine different models for operation at temperatures up to 170C. Forward current ratings range from 250 ma. to 50 amps, with peak inverse voltage ratings of 71 to 300 v. Application data is available from Federal Telephone & Radio Co., Components Div., 100 Kingsland Rd., Clifton, N. J.

• **Servo motor,** low inertia size 15, for 115 v., 400 cps use, can be operated over temperature range of −60 to 120C. No-load speed is 5,000 rpm, stall torque is 1.5 in.-oz. Basler Electronics, Inc., Highland, Ill.

• **Frequency sensor,** designed to close a set of contacts at a designated frequency which is adjustable over a moderate range. Type RY-429, for example, can be set to operate at any frequency between 350 and 450 cps. Unit operates from 115 v., 250 to 1,000 cps power, over temperature range of −55 to 125C. Contacts are rated 3 amps, come in 3PDT arrangement. Unit is hermetically sealed. Electronic Specialty Co., 5121 San Fernando Rd., Los Angeles 39, Calif.

• **Subminiature regulated d.c. power supplies,** employing magnetic amplifiers, are available in variety of sizes and

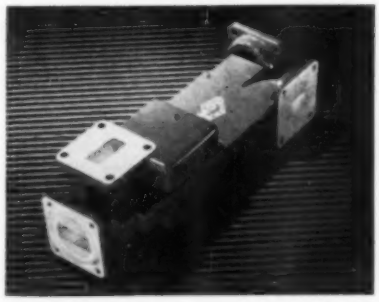


ratings, from 5 v. for strain gage and transducer operation to 550 v. for regulated plate supplies. Arnoux Corp., Dept. AW-5, Box 34628, Los Angeles, Calif.

Microwave Devices

• **Ferrite isolators,** employing field displacement resonance absorption technique, with isolation to insertion loss ratios as high as 500:1 are available in new line, custom designed to requirements. Model 165-1A, for operation at 8.8 kmc., is rated 50 watts average power, 25 db. isolation and 0.25 db. insertion loss. Unit weighs only 12 oz. Insertion length is 1.9 in. Kearfott Co., Inc., Western Div., 253 Vinedo Ave., Pasadena, Calif.

• **X-band ferrite circulator, Model** 601, with front-to-back ratio approaching 300:1, operates over frequency range of 8.5 to 9.6 kmc. Isolation is quoted at 30 db. minimum, with insertion loss less than 0.2 db., and return loss



of 30 db. minimum. Input VSWR is 1.2 maximum. Company says that other configurations will be available soon. Microwave Development Laboratories, Inc., 92 Broad St., Wellesley 57, Mass.

The Perfect Amphibian...

CESSNA 180 ON Edo FLOATS

Your Cessna 180 on Edo amphibious floats gives you great new utility you never dreamed possible before. Suddenly, you have a million landing places—every lake, harbor, river, plus regular airports.

And you get such wonderful performance with the Edo 180 ... over 135 mph cruise, fast take-off from water, the nicest handling characteristics on land. At last a really nimble amphibian!

Investigate how Edo amphibious floats will improve the usefulness of your Cessna 180. They're easy to install, easy to remove during seasons when water operations may not be desired. Available for prompt delivery. See your Cessna distributor or write for float brochure.

Standard Edo floats available for all single engine Pipers, Cessnas and many other types.

Edo Model 289 amphibious floats feature retractable, wide-tread, four-wheel gear each with long-travel oleo struts. Surprisingly little weight penalty.

EDO CORPORATION • College Point, L.I., N.Y. *Fine Floats since 1925*

USAF Air Defense Command to get first Starfighters . . .

NEW GENERAL ELECTRIC J79 GIVES ADC's LOCKHEED F-104A SUPERSONIC CLIMB RATE, HIGHEST OPERATIONAL CEILING

RAPID J79 DEVELOPMENT was accomplished at General Electric through advanced engineering and test methods. The J79 went from drawings to test cell in 18 months.

"WRINGING OUT" THE J79 in special XF4D flight tests at Edwards AFB in late 1955 helped speed the engine's development program. Weeks before installation in Lockheed's F-104A, the General Electric J79 was ready-to-go, proved in flight.

F-104A ROLL-OUT. General Electric's Jay Wethe, Neil Burgess, Gerhardt Neumann congratulate Joe Ozier, Lockheed test pilot, during roll-out ceremonies at Palmdale, California.

When the first Lockheed F-104A Starfighters join the Air Defense Command, ADC will receive an outstanding interceptor for operation at both low and high altitudes. Powered by General Electric's light-weight J79 jet engine, the Starfighter can fly as fast as a 16-inch shell. It has a 'maximum ceiling' above that of any other aircraft.

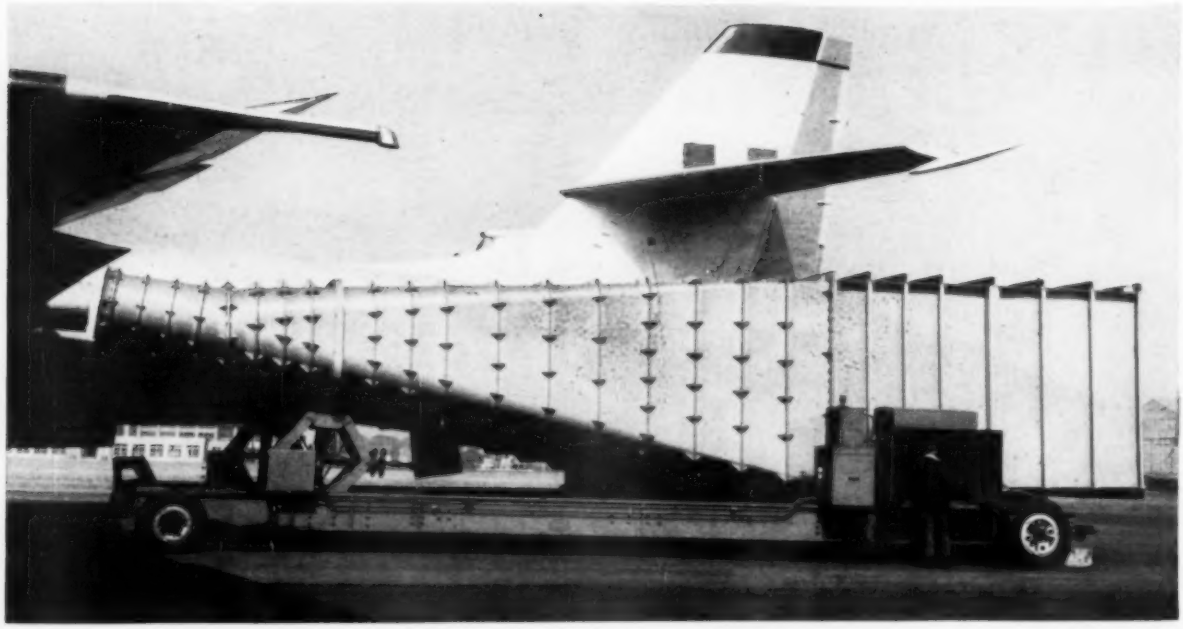
These General Electric J79 features help make the Starfighter's performance possible.

- Develops more thrust per pound than any other turbojet in its power class.
- Is highly efficient at both sub- and supersonic speeds.
- Has light-weight construction for steep climb-speed ratios.
- Unique design innovations for high altitude operation.

Already in production for the Starfighter, the J79 is today being tested for still newer weapons systems—soon to be announced. General Electric Company, Cincinnati 15, Ohio. 235-9

Progress Is Our Most Important Product

GENERAL ELECTRIC



Three Mufflers for Jet Runups

Britain's first mobile jet engine muffler (top) reduces noise of Valiant bomber 20 decibels at 100 yards. Device has twin bell-mouth entry sections that widen out in long cone to a large splitter box, 15 ft. long with parallel plates 6 in. thick filled with sound absorbent material. Pratt & Whitney Aircraft Co., 6-ft. long suppressor has three conical shrouds surrounding a perforated metal cylinder (AW May 28, p. 91). It is clamped to J57 engine on B-52. Gloster Javelin (below) is in brick pen with aluminum sheathing on walls and 76 ft. long silencer. Well accommodates nose wheel.

Cartridge, Old Standby, Expands in Use

By George Christian

New York—An old type of auxiliary aircraft power source, the cartridge, is expanding into new, diversified uses, an AVIATION WEEK survey reveals. Some airplane makers are more in favor of the explosive powerplant than are others.

With one exception, each of the airframe manufacturers questioned said that they contemplated or were engaged in research or experimental programs aimed at extending the use of CAD (cartridge-actuated devices) into untried fields. (Units are also called explosive-actuated devices, and ballistics-actuated devices.)

Development Program

Hercules Powder Company, Inc., a major supplier of the explosive cartridges, is itself in the middle of a development program to make the devices smaller, more environmental resistant.

Impetus to their use in aircraft was given by a recent CAD development program sponsored by the Air Force and carried out at the Pitman-Dunn Laboratories of Frankfort Arsenal for the Ordnance Corps.

It resulted in the design and fabrication of various cartridge-actuated devices as standardized aircraft items. With the growing acceptance and need for CAD, organizations as the American Machine & Foundry Co. have been assigned to CAD projects. AMF's Mechanics Research Department, in Chicago, which has its own Ballistics Research Department at Colorado Springs, Colo., has been active in the research and development for CAD used on several modern combat aircraft.

Fighters to Bombers

CAD, which rarely have deviated from seat ejection and engine starting, are being asked to do more jobs on single-seater fighters. The devices are also moving into larger aircraft which carry several crew members, and are consequently taking on more complex, often multiple-cycle duties. (Forms of CAD have been used for such jobs as blowing belly-slung bombs away from single-engine dive bombers to make sure they cleared the propeller arc and in the form of explosive attachment bolts to salvo externally-carried stores.)

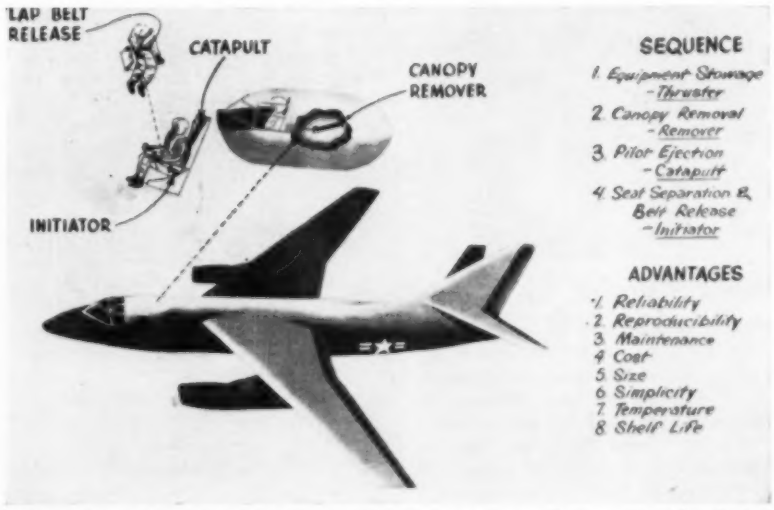
Current CAD applications, as cited by AMF, fall under these four categories:

• **Thrusters,** used to position crew seats immediately prior to ejection, stow gear as control columns or radar bomb sights away from the ejection path where they might injure a crew member, and unlock the canopy.

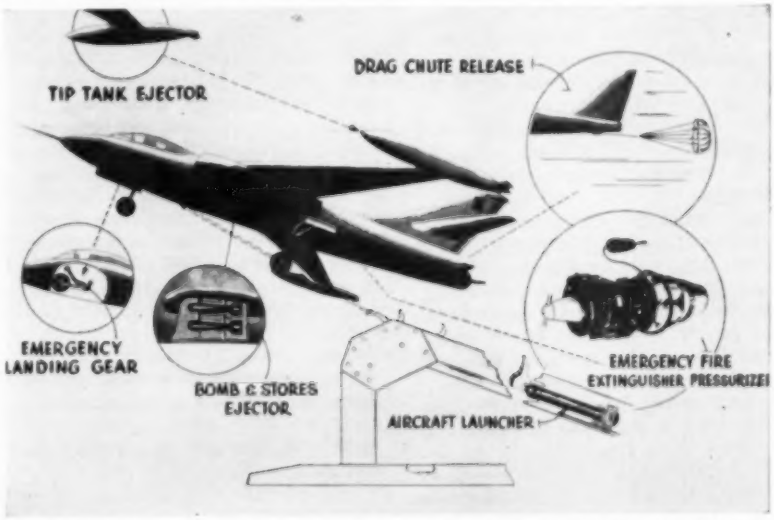
• **Removers,** which jettison the canopy (or similar protective structure) in the proper ejection sequence.

• **Catapults,** which eject crew members from the aircraft.

• **Initiators,** which serve, in effect, as pneumatic switches to operate other CAD items such as seat separators and safety belt releasers.



ESCAPE SYSTEM developed by American Machine & Foundry Co., uses cartridge devices to trigger equipment stowage, canopy removal, pilot ejection, seat separation, lap belt release.



PROPOSED CAD applications by AMF are pictured in circles related to section of aircraft.

Because CAD has to provide escape means for several crew members in a bomber, it necessarily has to perform more and increasingly complex jobs. Among the system's new requirements are that CAD initiation be possible from several points in the plane and by several crew members. Equipment stowage problems prior to ejection become more difficult because of the increased number and types of units to be moved in many different parts of the airplane.

AMF's Mechanics Research Depart-

Klimp Clamps on Crate

Packer is clamping the lid on a cleated box using Klimp, a new spring-steel clamp developed by North American Aviation, Inc. The device has over 30 times the holding power of a nail and can be reused many times. Since the Klimp does not damage crates, they also may be reused. The fasteners are easily tapped into place with a specially designed hand tool.

ment proposes these newer applications for CAD: tip tank, bomb and stores emergency ejection; emergency landing gear extension; emergency fire extinguisher pressurization; drag chute release, and aircraft launching.

Here are additional proposals—and comments—made about CAD by various airframe manufacturers:

• **Douglas.**

Aside from the conventional CAD applications of canopy jettisoning, seat ejection and engine starting, Douglas sees a quantitative increase of CAD. The Navy has a growing requirement for cartridge assistance for releasing externally-mounted stores. CAD will also be used to release internally-mounted stores because of difficulties encountered in obtaining proper release into high speed slip streams.

• **North American.**

Experimental work on CAD for uses other than the conventional has been under way for some time. Beginning with the F-100C, CAD is being used to eject forcibly drop tanks which, when empty, tend to cling to the airplane. Two cartridge-actuated pistons on each tank force the tank down and away from the pylons.

Experimental work is being conducted in the use of CAD to start high-speed motion picture cameras. Cartridge operation is particularly desirable when the cameras are used for instrumentation tests because the device gives a faster start, which is so important in filming rapid sequences.

North American Aviation's human factors group has done considerable investigative work in the use of CAD in connection with pilot ejection.

• **Republic.**

Generally, CAD is useful anywhere in an airplane where a job has to be accomplished quickly and with a high degree of reliability. It is the smallest power pack man has yet devised for use on aircraft.

It can be put to such one-shot, emergency uses as blowing loose external stores, extending landing gear or flaps or even applying brakes. By using several cartridges, CAD can perform multiple operations, as recharging several guns several times each.

• **Convair.**

CAD (here called ballistics-actuated devices) are excellent to operate seldom-used, one-shot emergency items which you have to have in a hurry. However, Convair has some reluctance to use CAD because of the ever-present danger of the device starting a fire. Since Convair aircraft usually incorporate high pressure air systems, the company prefers to use non-flammable pneumatics to do jobs other companies are giving to CAD.

A test program currently under way at Convair is to use CAD to get rid of spin chutes after recovery.

• **McDonnell.**

The company divides CAD into two categories—equipment uses and armament uses. Under equipment uses come: radar stowage and canopy release prior to ejection; ejection; seat belt disengagement and harness release after ejection. Armament uses include: use of explosive or frangible bolts to jettison Fiberglas cocoon from missile installation prior to missile launching; jettison missile from rail in case of misfire; jettison external stores pylon; and emergency release of spin chute at high altitudes.

• **Boeing.**

It appears there may well be expanded uses of CAD in future military aircraft.

Boeing did not specify any particular application.

• **Lockheed.**

Nothing of an uncommon nature is being done here with CAD currently.

Small, Powerful & Reliable

Those who advocate CAD like it because the cartridge provides a lot of reliable power in a small package.

AMF listed these attributes of the device:

• **Performance** is reliable and reproducible.

• **Cartridge** provides a lot of power, yet is small.

• **Energy** is readily available.

• **Little maintenence** is required.

• **Cost is low.**

• **Component design** is simple.

• **Operation is** relatively insensitive to temperature.

• **No significant** deterioration occurs during long storage periods.

CAD applications also extend to guided missiles where they are used in many classified applications. One known use is to perform switching jobs normally done by much bigger and heavier solenoids.

Lightweight Seat Has Adjustable Width Legs

London—Three lightweight, adjustable width aircraft passenger seats are under development by Microcell Aircraft division of Microcell, Ltd., London.

One unit, a standard, berthable twin-seater, is in production; the other two—twin- and triple-seat tourist units—are in prototype form. On all three seats, leg width may be adjusted laterally to conform to varying seat track spacing.

In the standard seat, Fiberglas is used for the back and arm framework, and

BERTHABLE twin-seat unit is in production.

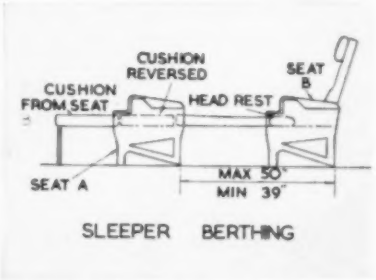


DIAGRAM shows how berth make up.

ARROWS indicate where legs adjust.

aluminum for the seat frame. The seat proper is supported on a nylon base. The back can be adjusted from 16 to 68 deg. from the vertical and may be fully reclined to form a berth. The seats may be converted into double berths when centers range from 39 to 50 in. The seats are equipped with adjustable leg rests.

The double units weigh 67 lb., can withstand 9Gs facing fore or aft, and have been approved by the British Air Registration Board. Price is approximately $850.

The tourist seats will be in production in a few months. The three-seater weighs 60 lb. and costs about $625. The two-seater weighs 42 lb. and will sell for approximately $425. Both units have seat widths of 17½ in. and a back adjustment range from 12 to 40 deg. from the vertical.

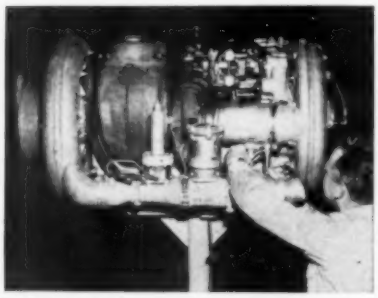
OPERATOR presses starter on Boeing 502-11B gas turbine compressor in front of B-52.

Boeing Produces New Air Starter

An improved compressed air starter unit which develops 210 air hp. for starting large jet engines and checking out aircraft pneumatic and air conditioning systems is being produced by the Industrial Products Division, Boeing Airplane Co.

The unit, designed for the Air Force, is available to commercial jet transport operators.

The 375 lb. machine is made up of a Boeing-developed, single-stage compressor driven by a Boeing 502-11B gas turbine.



SINGLE STAGE compressor (left end of engine) produces 70 air hp. more in new Boeing 502-11B starter unit than twin-stage compressor produced in 502-7D unit now in service.

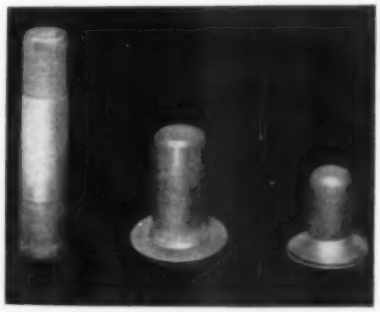
Design simplification over the previous Model 502-7D resulted in reducing the number of basic engine castings from 18 to 7, elimination of nine outside pipes and 46 plumbing fittings in the oil system, and cutting the impeller production costs in half.

Boeing-developed floating slipper bearing eliminates costly compressor balancing and increases bearing life and thrust load capacity at high speeds. This, in turn, removes previous speed limitations to the centrifugal compressor, allowing greater efficiency and pressure ratios because of the higher permissible rpm.

Other improvements include combining fuel system components to reduce plumbing, simplification of accessory drives and burner and nozzle details.

An automatic starting system also is included in the unit.

The shaft-drive counterpart of this air compressor, the 240 hp. Boeing 502-10C, will be used by the Navy and the Creole Petroleum Corp. as powerplants various types of small vessels.



THREE typical fluid-tight rivets are slug type (left), used with automatic machines; replacement rivet (center) for reworked holes, and washered rivet (right) with .010 in. underhead thickness.

Self-Sealing Rivets Utilize Soft Sleeve

Rivets which automatically seal against fluid or air leaks without use of conventional sealing agents are being mass produced by Pastushin Aviation Corp.

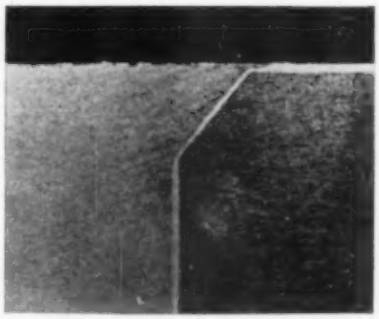
Called fluid-tight, the self-sealing rivets are intended for use in such structures as internal and external fuel tanks, flying boat hulls, pontoons, pressurized fuselage sections, and any other structures for which liquid- or air-tight sealing is required.

The sealing quality derives from a soft aluminum sleeve around the shank of the rivet which extrudes into the hole in which the rivet is being driven.

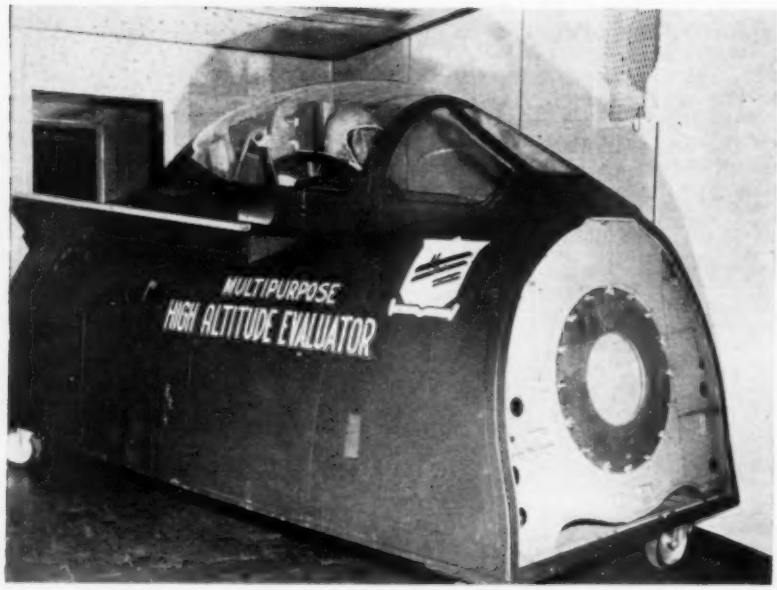
There are three types. The slug type has an .004 in. jacket, and a replacement type has a .007 in. jacket. Washered type has .010 underhead thickness.

Fluid-tight rivets are available for immediate delivery in standard or special sizes and for use in automatic drilling and riveting machines or for normal, hand installation.

The entire series of fasteners has undergone complete laboratory testing for shear strengths and fatigue and surge pressures.



EXTRUSION of soft .004 in. aluminum alloy jacket of slug-type rivet (left) is marked by white line in micophoto. Extrusion of jacket in driving completely fills all leak areas of hole.



PRESSURIZATION in this cockpit salvaged from a crashed F-86 can be increased to 5 psi. more than the altitude being simulated in the chamber in which it rests. Diaphragm in front can be ruptured to simulate rapid decompression from canopy loss. Canopy was rebuilt to slide back on rails instead of raise like that in an operational F-86.

F-86 Cockpit Simulates 150,000 Ft.

A pressurized cockpit salvaged from a crashed F-86 Sabrejet has been instrumented by the Air Research and Development Command's Wright Air Development Center to simulate altitude conditions up to 150,000 ft.

Primarily designed to permit studies of pilot efficiency and reactions under extreme high-altitude flight conditions and sudden decompression, the cockpit has been modified to fit into the development center's altitude chamber. It can be pressurized to 5 psi. greater than the air pressure in the chamber and then suddenly equalized with the chamber pressure, simulating loss of cabin pressure by explosive or rapid decompression.

The loss of cabin pressure is accomplished by the remote-control puncturing of a 22-in. diaphragm on the front of the cockpit.

The canopy, normally hinged at the back, was altered so that it will slide open.

The seat simulates an ejection by raising electrically above the top of the cockpit. (Below, left.)

Aileron, rudder and elevator controls have been instrumented to determine pilot reaction to very-high-altitude flying.

In addition, Wright scientists hope the cockpit also will permit studies of long-range flight problems at high altitudes, the effects of bulky equipment, visual problems and the integration of equipment and clothing with the pilot.

From this, they hope to improve pilot efficiency through the redesign of cockpits and modifications in clothing and equipment.

SEAT can be raised electrically to simulate an ejection for measuring a pilot's reactions.

Tire Cord, Seat Belt Impact Stress Studied

Ability of textile yarns to withstand high-speed impact stresses or shock loadings, imposed by modern aircraft may be increased as one result of a study undertaken by the National Bureau of Standards.

The study relates to the extremely high rates of strain experienced by airplane tire cords during fast landings, to the shock loadings induced in the safety lines when accidents occur and to the shock loadings induced in the fabric, shroud lines and webbing of a parachute snapping open.

The study seeks to determine the effects of high rates of strain on textile materials and to relate these results to the molecular structure of the fibers and the geometry of the yarns and fabrics.

Hoped for results: textile fibers having better impact properties.

OFF THE LINE

Engine Components Section has been set up by Aero Supply Mfg. Co., Inc., Corry, Pa., to design and manufacture aircraft fuel system components, subcontract accessories and specialized hardware. Purpose is to consolidate into one unit the problems associated with the development of such components, permit closer quality control, and increase manufacturing efficiency.

Ohio Aviation Co. has been appointed as an authorized factory dealer for Collins Radio Co. The agency is prepared to service all Collins communications, navigation, flight control and instrumentation equipment. Address: Dayton Municipal Airport, Vandalia, Ohio.

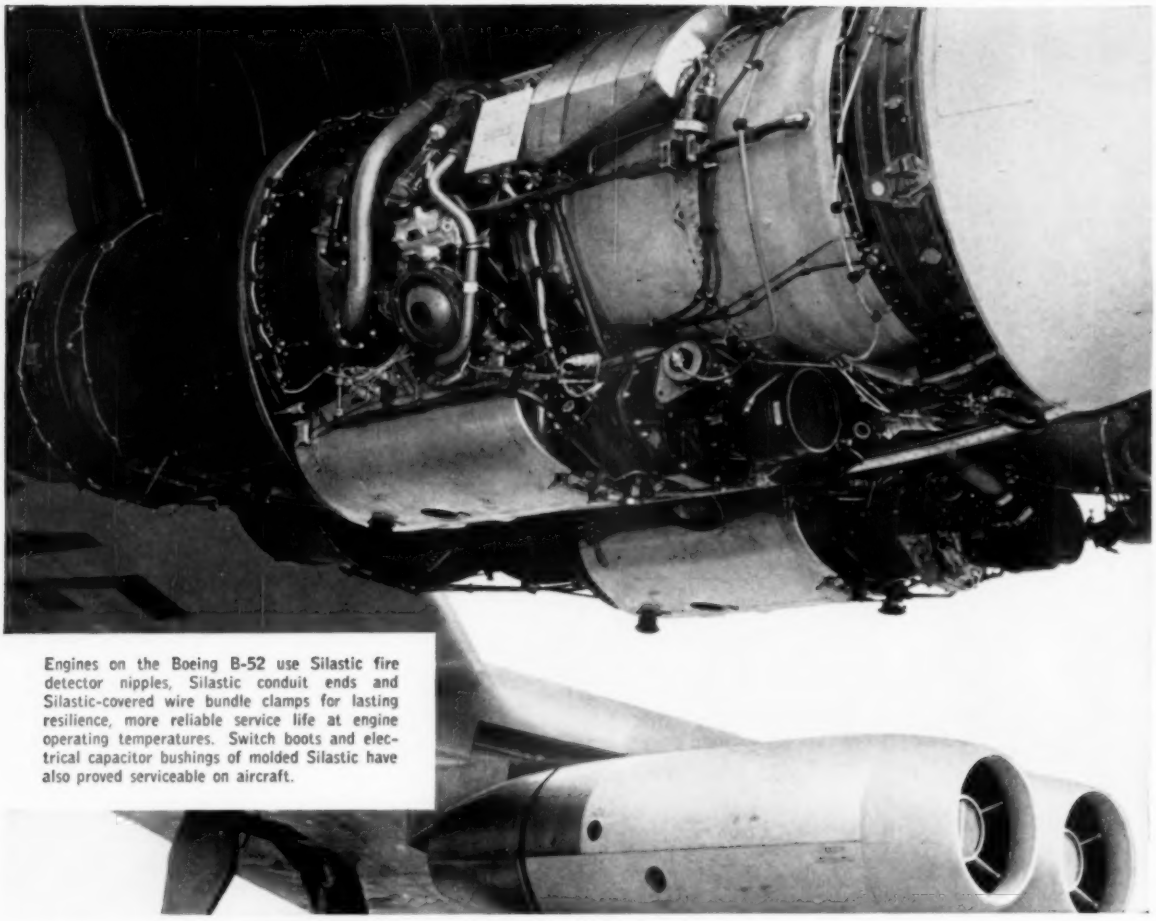
Luria Engineering Co. has received $14-million Air Force contract for a newly designed, all-weather maintenance dock to service such large aircraft as the B-52, C-133 and C-124. The company will build the docks in the U.S. and supervise their erection overseas. Structures house the entire aircraft except the rear fuselage and tail group which protrude through a fabric curtain.

Design, development and manufacturing activities at the Propulsion Research Corp., a West Coast subsidiary of Curtiss-Wright Corp., have been consolidated into a single Accessory, Manufacturing and Test Department. Purpose is to make it possible for the company to accept a wider range of out-of-the-ordinary projects calling for special accessory equipment.

Northwest Orient Airlines is installing Sperry engine analyzers, dual integrated instrument systems, and A-12 automatic flight control systems with beam coupling equipment in its DC-6B and DC-7 fleet.

Solar Aircraft Co. was recently awarded a $2,456,417 Air Force contract for Jupiter gas turbine-powered ground support equipment. Called Type MA-2 gas

Everywhere you look, "miniaturization" has meant progress and profit. The automobile is packed with many more features, much more power, all in the same space through miniaturization.
Big profits are coming in smaller packages!
This book tells how Elgin's "Practical Miniaturization" can help you! Write for it today!
Today's telephone depends on more dependable, "miniaturized" assemblies. Better performance, reduced costs—these are the keynotes of "Practical Miniaturization".
Progress and Profit through Miniaturization
how ELGIN'S "practical miniaturization" can help you
ELGIN NATIONAL WATCH COMPANY
MICRONICS DIVISION • ELGIN, ILLINOIS



Engines on the Boeing B-52 use Silastic fire detector nipples, Silastic conduit ends and Silastic-covered wire bundle clamps for lasting resilience, more reliable service life at engine operating temperatures. Switch boots and electrical capacitor bushings of molded Silastic have also proved serviceable on aircraft.

SILASTIC molded parts stay serviceable at 500 F

SILICONE RUBBER

Molded parts of Silastic*, Dow Corning's silicone rubber, show little or no change in physical or dielectric properties after long exposure to temperature extremes which would quickly ruin organic rubber. Leading rubber companies fabricate Silastic molded parts in practically any color, size or shape.

Get latest data on Silastic

Mail coupon today

Dow Corning Corporation, Dept. 0907-c
Midland, Michigan
Please send me latest data on Silastic

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

*T.M. REG. U.S. PAT. OFF.

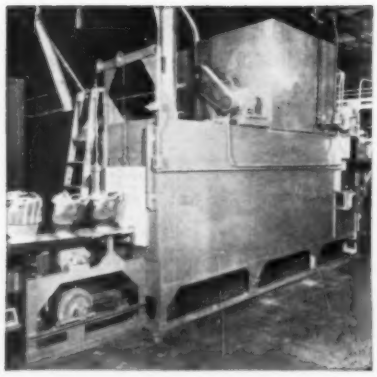
Typical Properties of Silastic for Molded Parts

• Temperature Range, °F	—130 to 500
• Tensile strength, psi	600 to 900
• Elongation, %	150 to 300
• Compression set, %, @ 300 F	15 to 40
• Hardness range, durometer	20 to 90
• Dielectric strength, volts/mil	400 to 500
• Oil resistance	Dependent on type of oil

If you consider ALL the properties of a silicone rubber, you'll specify SILASTIC.

first in silicones — DOW CORNING SILICONES

DOW CORNING CORPORATION • MIDLAND, MICHIGAN



Heat Cylinder Oven

This is Northwest Orient Airlines' new, $5,500 cylinder heating oven which evenly heats nine aircraft engine cylinders at a time. Advantage of the machine, according to NWA, is that the convection-type oven heats all parts of the cylinders evenly, avoiding "hot spots". Air is heated by a low pressure, 250,000 Btu. gas burner in a compartment above the oven. A 4,000 cfm. fan forces the hot air down through vertical ducts to a manifold under the oven. The air is discharged upward through nine nozzles, one for each cylinder. After passing through the cylinders, the air returns to the heater compartment to be reheated. Oven temperature is maintained at 500F. Operation is automatic, a motorized conveyor moves cylinders in one end and out of the other. Capacity is 100 units per eight-hour shift. The unit was built by Despatch Oven Co., Minneapolis.

turbine compressors, the 500 hp. machines will be embodied in multi-purpose vehicles to start large turbojet engines and to air condition aircraft. The Jupiter was originally developed for the Navy.

Glar-Ban Corp. has received a $33,000 order from Beech Aircraft Corp. for "bolt-lite" non-glare instrument lights.

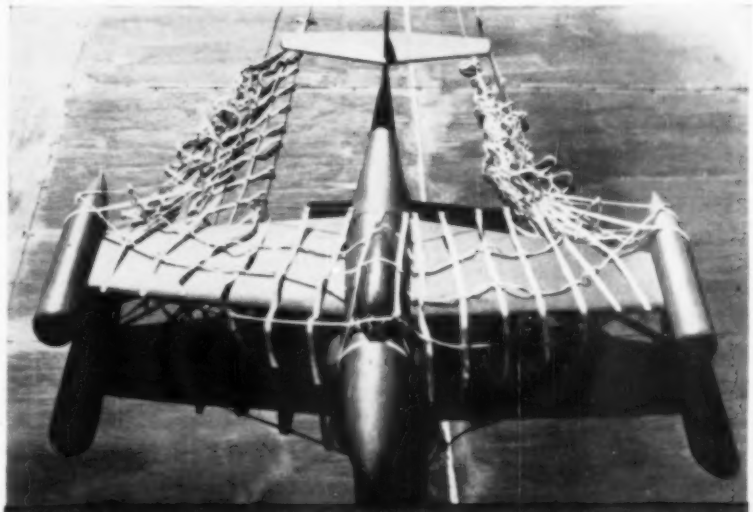
The lights give even illumination across the face of an instrument and reduce glare and light spillage to a minimum through the use of prismatic light control.

Address: 2241 Elmwood Ave., Buffalo 23, N. Y.

Bristol Aircraft Ltd. has concluded agreements with the Fokker Company, Holland, and the Societe Anonyme Belge de Constructions Aeronautiques (SABCA), Belgium, to manufacture under license the Bristol 100-gallon standard plastic drop tank.

First units to be made will be of a type designed for the Hawker Hunter fighter. Tanks will be made of asbestos-phenolic plastic.

ENGINEERS
for absorbing problems

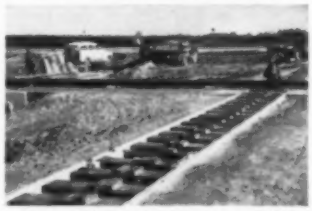


Airfield emergency overrun barriers for USAF are tested at AAE Georgetown facility on dynamic scale model airplanes.

For over 16 years, All American Engineering has specialized in the service of taking on tough engineering assignments for the aviation industry and the military. Knotty problems in the field of energy absorption – like those involved in the arresting gear project shown here – have become a speciality.

Engineers are needed now. Because All American offers a complete engineering and development service, work assignments are rarely routine. They concern really challenging engineering problems. In the past these have ranged over energy absorption devices, seat ejection trainers, air pick up equipment and various types of air-borne winches. Investigate for yourself the opportunities at All American.

ALL AMERICAN PROJECTS IN ENERGY ABSORPTION



Undergoing rigorous tests is this electronically triggered arresting gear known as the pop up barrier.

A totally new concept in energy absorption, the "water squeezer."

All American Engineering Company

DUPONT AIRPORT • WILMINGTON, DELAWARE

Trailers, Stands Designed for Jet Support

By Irving Stone

Pasadena, Calif.—A system of trailers and workstands has been developed by Air Logistics Corp. for maintenance and support of military and commercial aircraft.

Known as the air-log system, it is standard for the Air Force, Navy and Marine Corps and is being procured to support the following aircraft: F-89, F-100, F-101, F-102, F-104, F-105, B-52, B-47, B-57, B-58, F8U, F11F, FJ-3, FJ-4.

The trailers and stands are used for the installation, removal, transportation, repair, and storage of jet engines and aircraft components.

Match Rails

Under the system, trailers and stands match rails to permit components and engines to be rolled from one trailer or stand to another without the expense, hazard and time involved in using overhead slings or cranes. Rolling element between various engine and component adapters and the rails is the standard model 2500 roller adapter fitted with a clamping brake and a drive which permits the use of a standard socket ratchet or speed handle to roll the load along the rails.

Key unit in the air-log system is the model 4000-A heavy-duty positioning trailer, used for installation and removal operations. Precision positioning of the trailer is achieved through a combination of hydraulic and irreversible screw-type actuators which provide fore and aft tilt, roll and yaw. They also provide linear movement in three planes.

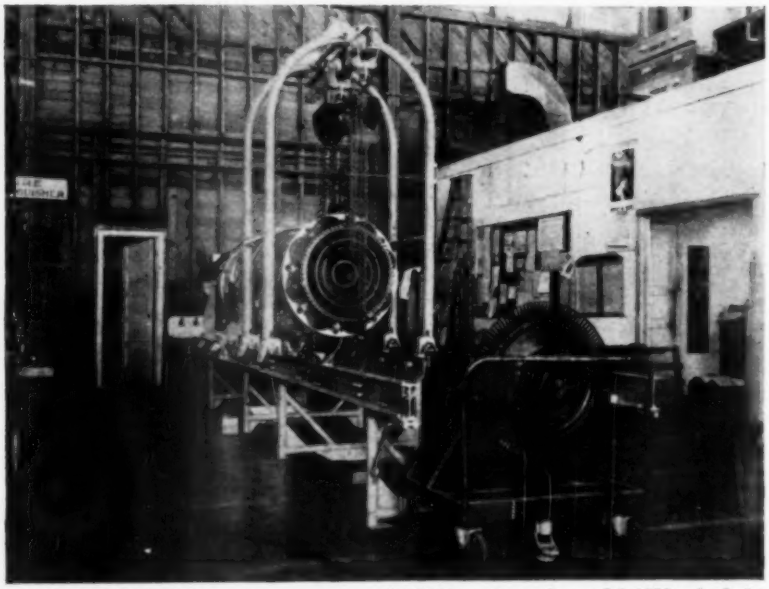
Model 5000 trailer is designed to facilitate engine buildup and overhaul. It provides 360 deg. of rotation for ease of access.

Transport Engines

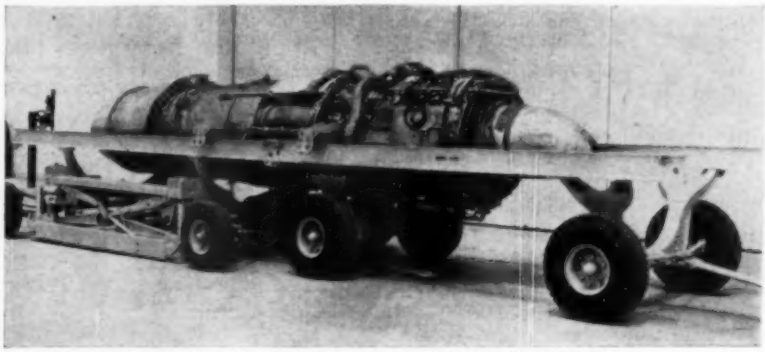
Model 3000 trailer is used for the transportation of engines and components to and from the installation area.

Model 3100 work stand is a lightweight folding unit which can be used for inspection, repair, buildup and storage of jet engines and aircraft components. An elaboration of this work stand consists of two units coupled together, using an overhead model 4600 yoke with two one-ton chain hoists mounted on trolleys where lift capability is desired.

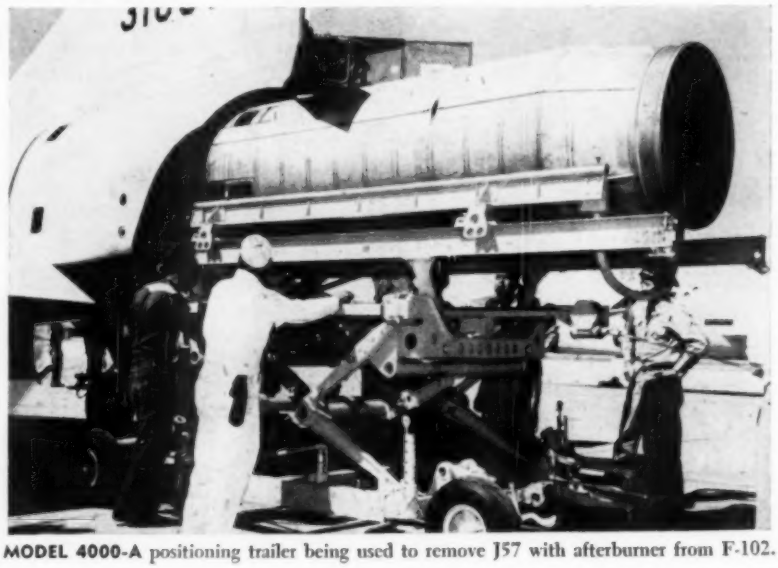
Model 3500 universal component adapter is capable of handling a wide variety of shapes ranging from a 15-in. diameter to a flat surface. The adapter uses a central tube on which fore and aft yokes may be adjusted to provide



MINOR ENGINE REPAIR system uses two model 3100 work stands, model 4600 yoke hoist.



J35 ROLL-TRANSFERRED from 4000-A trailer to 3000 trailer (right).



MODEL 4000-A positioning trailer being used to remove J57 with afterburner from F-102.

pads at any two points where bulkheads on the object being carried permit lifting. The universal component adapter is mounted on standard model 2500 roller adapters to permit transfer of the component between railed elements of the air-log system.

Engine adapters are designed to provide the link between the engine mount pads and the standard model 2500 roller adapters which rest or roll on the rails of the various elements of the air-log system. Thirty-five engine adapters have been designed to handle 98 different engine models.

Projected for inclusion in the air-log system is a model 6000 engineering specialist trailer designed to implement current specialized maintenance and tactical mobility concepts by equipping service personnel with tools, test equipment, checkout equipment, standard spare parts, and technical data in a highly mobile package. Version for which the trailer has been designed include electronic, electrical, powerplant, sheet metal and hydraulic specialist work benches.

Sub-Critical Reactor Shown In Display

A sub-critical nuclear reactor called the "pickle barrel" designed as a teaching aid by the physics staff of New York University was recently displayed in this country for the first time.

It was shown to members of the American Society for Engineering Education at the society's 64th meeting at Iowa State College, Ames, Iowa. The unit was constructed by the Atomic Energy Commission as a traveling display and was shown for the first time at an international exposition in Italy earlier this year.

The small reactor is used to demonstrate the distribution of neutron flux in the fuel and the moderator. It is also being used for research in exponential piles to determine the characteristics of a full-scale reactor having the same composition and arrangement.

The pickle barrel's fuel consists of 864 slugs of natural uranium canned in aluminum. Each slug is one inch in diameter, eight inches long and weighs approximately four pounds. The four layers of slugs are arranged in a hexagonal pattern.

Since the reactor does not contain sufficient uranium to sustain a chain reaction, a neutron source had been added near the center of the reactor. The source is a two curie radium-beryllium source.

Three hundred gallons of tap water are used as a moderator to slow the neutrons to thermal energy level and shield workers from the neutrons and high energy gamma radiation.

MEASURING UNITS: Electro-optical pick-up (left), blade tracker (center), indicating meter.

Vertol Uses New Blade Adjustment

Automatic individual adjustment of each rotor blade's pitch will be used to smooth helicopter flight, says Vertol Aircraft Corp., Morton, Pa.

Development of an in-flight blade-flopping angle measuring device by Chicago Aerial Industries, Melrose, Ill., has prompted Vertol's interest in this refinement.

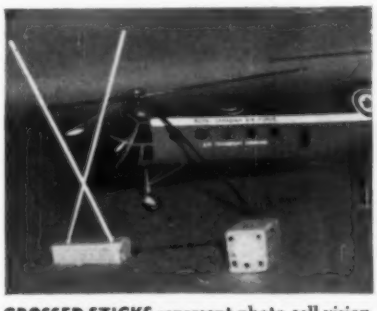
Currently being used by Vertol to replace the old-fashioned "flag" method of adjusting helicopter blade pitch angles for uniform flapping angle, the optical-electronic tracker will be used as the feedback sensing means in Vertol's automatic control.

The two photographs illustrate the principle of operation and appearance of the new tracker. In the picture of the toy model of the set up, the crossed white sticks pointing up at helicopter model's rotors represent the lines of "vision" of two photo-cells mounted in the pick-up box, which in this case is mounted on the ground. By noting the interval between the time a blade blanks off daylight from the first and second cell, the computing circuit in the control box is able to indicate how high each blade is—the longer the interval the higher the blade. To complete the calculation, the pick-up boxes distance out along the blades must be dialed into the control cabinet along with an rpm. impulse signal.

The larger picture shows the tracker mounted inside one of Vertol's H-21 helicopters for flight tests. The three units of the tracker are mounted in the helicopter's belly underneath the rotor. The box to the left is the pick-up.

The photo-cells inside see the blades through an open hatch overhead. The console in the middle contains the output meter which shows within 1/10 in. how high or low the blades are from the correct flapping angle. The knob below the output indicator selects the blade to be observed and the dial to the left sets the radius. The small box to the right is an additional indicating meter for remote use.

Vertol predicts that the device which is manufactured by Chicago Aerial Industries, when incorporated in the complete automatic control will give better helicopter performance, life and smoothness.



CROSSED STICKS represent photo-cell vision.

Aluminum Reduction Plant for Harvey

Harvey Aluminum, a division of Harvey Machine Co., Inc., Torrance, Calif., will build a 54,000-ton aluminum reduction plant at The Dalles, Ore.

Construction will begin about Aug. 1 and completion is scheduled for 1957.

The company plans to increase capacity of the reduction plant by 13,000 tons in 1958. During 1960-1963 it will build a second reduction plant of 67,000 tons annual capacity and a 130,000-ton alumina plant. Under an interim five-year agreement, Harvey will get alumina from two Japanese companies.

Flight Test Figures of C-130 Revealed

Performance figures drawn from two years of flight testing of the Lockheed C-130 Hercules confirm what flight demonstrations last year revealed (AW July 25, 1955).

With full payload—25,800 lb.—and full fuel load—5,080 gal. of JP-4, the C-130 can:

- **Take off** over a 50 ft. obstacle using 2,800 ft. of runway.
- **Cruise** on a combat mission at 330 mph. with a range of 2,880 mi.

Rate of Climb

Lockheed says that the transport, powered by four Allison T56-A-1 engines of 3,460-hp. each, can take off and climb to 2,500 ft. in 60 sec. at a 25-30 deg. angle climb with military power.

The design take-off weight is 120,000 lb. (full fuel). On a logistic support mission, maximum take-off weight is 124,000 lb.

At a lighter gross weight—100,000 lb. Lockheed says the C-130 can:

- **Take off** in less than 1,500 ft.
- **Land** with a ground roll not exceeding 1,000 ft.

Altitude range of the C-130 is up to 40,000 ft.

Pressurization system maintains an 8,000 ft. altitude inside the fuselage when the C-130 is flying at 35,000 ft.

Top speed is over 370 mph. Comparison performance figures for different weights and missions:

- **Combat mission.**

Flight limit load factor, 3.0; payload, 25,800 lb.; average cruise speed, 330 mph.; radius, 1,500 mi., and range 2,880 mi.

- **Logistical Support.**

Flight limit load factor, 2.5; payload, 39,400 lb., (maximum cargo); average cruise speed, 335 mph., and range 1,940.

- **Logistical Support.**

Flight limit load factor, 2.5; payload, 31,500 lb. (maximum fuel); average cruise speed, 335 mph., and range, 2,760. mi.

Previous figures for the capacity of the main compartment had been given as 3,680 cu. ft. The 4,300 cu. ft. now quoted is not an increase in compartment size. Earlier figures were based on certain MATS cargo arrangements, which included leaving space for an 18 in. aisle.

Equipment List

Equipment of the airplane includes ground and in-flight air conditioning, thermal de-icing system for wing and empennage leading edge, armor protection against small arms fire for pilot, co-pilot and engine nacelles, single point refueling, E-4 auto-pilot, and provisions for aft-facing passenger seats. Length of the production version has been increased from 95.2 ft. to 97.7 ft. due to a longer, improved radome.

Deliveries to the Tactical Air Command are to begin late this year.

Air Force has just recently accepted Aeroproducts turboprops for installation on C-130. Previously, Curtiss-Wright prop had been contemplated.

TOP SPEED of over 370 mph., C-130 requires T-33 as chase plane on tests.

IMPROVED RADOME on production model increases length from 95.2 to 97.7 ft.

Japan Orders First Home-Designed Jets

Tokyo—First Japanese-designed and manufactured jet planes will make their debut by October, 1957. The planes, intermediate trainers, will be produced experimentally by the Fuji Heavy Industries for the Japanese Defense Agency.

Fuji's designs have been selected over those submitted by three other Japanese aircraft firms.

Altogether, three jet trainers—one for structural strength tests and two for flight testing—will be constructed from August, 1956, to October, 1957, under a contract to be concluded shortly.

The Defense Agency has appropriated $833,000 for Fiscal 1956 for this purpose. Mass production of the aircraft will begin in Fiscal 1958 at a cost of about $150,000 each.

The new intermediate jet plane—to be called the T1F1—will eventually replace the T-6G propeller trainers now

being used by the Japanese Air Defense Force. It will have a maximum speed of 496 mph. Its length will be 39 ft., wing span 34 ft., and weight 3.3 tons. The three test planes will be equipped with Orpheus engines produced by the Bristol Aero-Engines Ltd. of Britain. Trainers to be built on a mass production basis will be equipped with J3 engines produced by the Japan Jet Engine Co., which is now engaged in test production.

The first flight test is scheduled for October, 1957. Actual training of Japanese pilots with these planes will start in the middle of 1959.

The Defense Agency is hoping to receive U.S. financial aid in the manufacture of the new jets.

Thiokol Acquires Site for Utah Rocket Plant

Acquisition of 12,000 acres in Utah for Thiokol Chemical Corp.'s western plant site for solid propellant rocket motors will increase to four the number of rocket facilities operated by the company.

Operations at the new site north of the Great Salt Lake are planned to begin January 1, 1957, with more extensive activity scheduled for July that year.

Thiokol propellants are based on the addition of an oxidizer to the synthetic rubber developed by the company. Cal-Tech's Jet Propulsion Laboratory was first to discover the value of the rubber-based fuel. Thiokol exploited the JPL approach by starting intensive work at the firm's Elkton, Md. plant in 1948.

Later Army Ordnance invited Thiokol to move its rocket division to Redstone Arsenal.

Women Recruited for Propulsion Research

London—Armstrong Siddeley Motors Ltd., Coventry, England, is pioneering with the recruitment of young women for research and development work in gas turbines and rockets. The company makes engines for a number of aircraft in and outside the Hawker Siddeley Group.

In the last few years its research and development work in gas turbines and rocket engines has grown extensively and it is now seeking women under 21 to enlarge its young research team. These women will be required to undertake the analysis of engine test results and other problems of stress and weight.

They will be given the opportunity of studying to obtain academic qualifications in engineering.

(*Advertisement*)

Valve Talk

FOR WM. R. WHITTAKER CO., LTD.

BY MARVIN MILES

Covering a hydrogen bomb test is something like playing hide and seek. The test people hide the vital facts and you seek them.

Not that the Atomic Energy Commission and the Navy and the Air Force didn't help us. They did, in hundreds of ways, from handouts and press conferences to the sharpest handling of communication transmittals for us from the USS Mt. McKinley.

It turned out to be a game, nevertheless. There were many things we could not be told; yet there was not the slightest censorship. We were privileged to write anything we pleased.

It was the first time any newsman had been allowed to see a thermonuclear test, in a way an experiment in news coverage. The operation was planned months in advance by AEC officials for Operation Redwing. Personnel on Eniwetok and Bikini atolls were thoroughly briefed on what they could and couldn't say. Our tours of the test facilities were carefully prearranged and "dry run" to eliminate hitches.

In other words, we eight writers invited to the test were warmly welcomed guests, told everything consistent with policy, carefully escorted on planned inspections and, in a sense, silently challenged to make wine out of water if we could, although estimates would not be discussed.

So, during our long stay in the area, we chipped away at the big secrets: The expected yield of the blast? Was it to be test device, true bomb or missile warhead? From what altitude would it be dropped? At what level would it explode? What variable factor was involved? What would be the missions of test planes in the array?

A small bonus shot we were permitted to see developed another question during the long wait for Cherokee, the big H-shot. Was it atomic or could it possibly have been hydrogen? A vital point that led to what I consider the most significant story in 172,400 words filed by the eight of us from the communications ship.

Covering such a story is like authorized espionage, in a way. You study everything you can, keep your ears open, ask carefully-framed questions of selected targets, take notes on anything and everything that might fit into a mosaic of analysis and understanding.

You build one answer into the next question, sometimes over an interval of days, and now and then you can read the truth in the way a man looks, how he smiles, how he evades when confronted with a query. You hoard the bits and pieces, work to fit them into the puzzle, and come up with a line of analysis that sometimes leads to a reasonable conclusion. Then you check the conclusion as best you can.

It was this way with the midget hydrogen blast. The picture was blank at first. Then two or three tenuous points fell into place and it became a blur. Several more dropped into line to point up a possibility. A few replies to scores of questions strengthened the hypothesis and gave importance to slips at first disregarded but not forgotten. Eventually came what we regarded as a clincher. We wrote of the "possibility" of midget hydrogen achievement.

In the same way I became convinced Cherokee was the first test of a missile warhead; that it would be dropped from about 50,000 feet and explode at about 10,000; that it had a variable factor of two (i.e., it could yield twice as much power as expected or only half as much); that the B-52 drop plane would escape unscathed; that other planes in the array would test blast and heat effects at certain angles and ranges, including one supersonic fighter stationed high and directly above the blast.

The actual power of the explosion was the big question and the most carefully guarded. Among the eight of us we had probably as many individual methods for determining yield — figuring distances, angles, stopwatch time, mill scales, horizon segments, etc., and overlaying them with a mental grid of known facts on H-blast fireball dimension, duration and power.

Even so, the awesome spectacle of the great blast was so overwhelming that most of us dared guess no closer than ten to fifteen megatons or the equivalent of ten to fifteen million tons of TNT.

Nor did we learn about the four-mile miss of the drop until long after we returned from the Central Pacific. But it's inconceivable to me that the error could have been that of the bombardier alone... not four miles... visually... on a lighted target. Bomb systems can go ape, you know. Ask any bombardier.

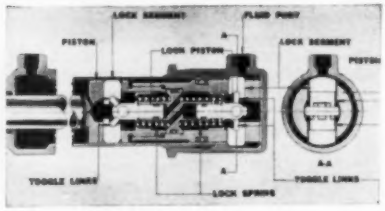
NEW AVIATION PRODUCTS

Hydraulic Test Machine

Single test machine performs test course formerly requiring two. Model HPM150-2H measures performance of variable displacement pumps and motors up to 75 hp., hydraulic flows from 1.4 to 41 gpm., and pressures to 3,500 psi. Higher horsepower tests can

be made by adding a hydraulic feedback system. Means of presentation and control and configuration of equipment are based on human engineering studies.

Greer Hydraulics, Inc., New York International Airport, Jamaica 30, N.Y.



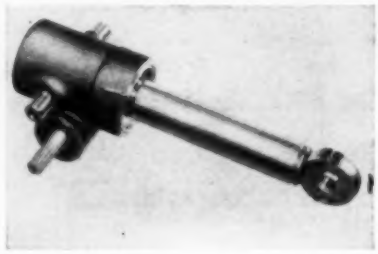
Internal Locking Actuators

Internal toggle lock actuator can hold and unlock under high external loads, and is designed to eliminate heavy, bulky external linkage used to keep landing gear and wheel doors locked. The actuators are designed to lock in the extended or retracted position. They were developed by the Boeing Airplane Co. and are used on the Model 707 jet transport. Manufacturing is under license. They are made in bore sizes from one inch up. Pressures are up to 5,000 psi.

Tog-Loc, Inc., P. O. Box 735, Bellevue, Wash.

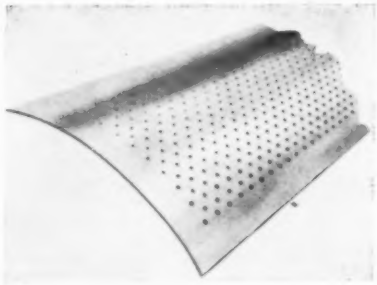
Light, Compact Screwjacks

A thin-envelope series of screwjacks for aircraft and missiles is available to meet individual stroke and performance requirements. The actuators have ro-



tary input with double-ended splined shaft permitting use of several units in series with flexible couplings. First reduction stage is worm and worm gear combination. Linear output is an Acme screwjack. Acme unit and trunnions are precision-ground alloy steel. Spherical bearing end fitting compensates for misalignments. Operating temperatures range from -65°F. to 275°F.

Southwestern Industries Inc., Los Angeles, Calif.



Perforated Sheet for BLC

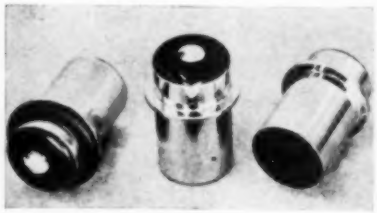
Designed especially for area suction boundary layer control Varaperf perforated sheet metal is strong, formable and free of the clogging associated with filter type porus materials. Flow permeability is controlled by hole size and distribution. Hole patterns can be tailored for uniform or gradient pressure drop.

Sheets can be made of aluminum or other high strength metals and cut to sizes and gages for aircraft, missile, and laboratory use. Use for transpiration cooling is possible.

BLC Porous Materials Co., Division of Engineered Fabrications, Inc., 1955 Lafayette St., Santa Clara, Calif.

High Resolving Transducer

Using ultrasonic echo sounding, the new transducer can detect a flaw closer to the immersed specimen surface than quartz crystal and can differentiate between two defects in the same area. A round plane flaw with an area of 0.0017 sq. in. can be detected 0.1 in. below aluminum surface by ¾ in. dia., 10 mc. high resolution transducer. Quartz crystal transducer could detect same flaw no closer than 0.3 in. from surface. Modifications are offered for special acoustic matching to the immersion



fluid, beam focusing to any reasonable depth, and special beam shapes. Broad beam transducers up to six inches wide have been delivered.

Industrial and Scientfic Products Division, Curtiss-Wright Corporation, Caldwell, N.J.

Temperature Probe for Mach 3

Total temperature probe for meeting critical accuracy requirements of outside air measurement in supersonic aircraft applications up to Mach 3 meets new USAF specification, Exhibit WCLEI-2-194, Amendment 1.

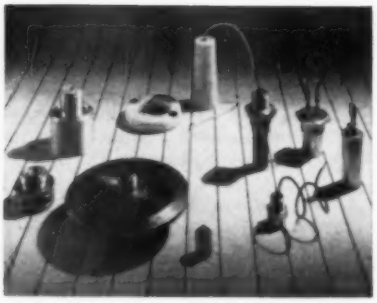
Probe model 101U has a hermetically sealed 50-ohm platinum resistance

thermometer element that does not sacrifice the very low time constant, the maker reports.

Rosemount Engineering Co., Rosemount, Minn.

Igniter for Solid/Liquid Fuels

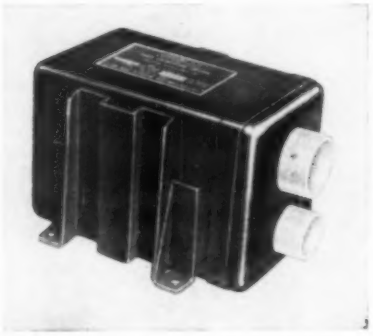
Igniters for solid propellants or liquid fuels can also be applied to pressure-



actuated systems. Where the igniter requires less than five grams of explosive, the squib is constructed integrally; in larger sizes, the igniter has provisions for taking a threaded-in squib.

Some types are based on special frangible plastic construction which volatilize completely, the maker reports, leaving no residue after ignition.

McCormick Selph Associates, 25 Hollister Airport, Hollister, Calif.



Missile Sequencer

Hermetically sealed control provides automatic programming of missile firing: opening of rocket pods, rocket launcher extension and other functions in proper sequence.

Designed to operate under shock, temperature and vibration conditions outlined in MIL-E-5272, Procedure I, the unit secures directly to the airframe.

Abrams Instrument Corp., Lansing, Mich.

Vibration Tester

Model 174 shaker unit for random vibration testing of components and assemblies weighing up to 30 lb. fea-

the QUICK answer to Stressed Panel Fastener problems...

CAMLOC SPF

HIGH STRENGTH ROTARY FASTENER

SPF eliminates shortcomings of other methods of securing removable structural panels...

- gives all the advantages of a thread plus continuous thread engagement
- overcomes cross-threading and stripping
- fastens and unfastens in less than a full turn
- compensates for "warpage" or "spring-back" of panels
- saves on structural weight and maintenance time
- provides positive clamping force of a bolt
- prevents deflection under loads

Get a quick answer to your stressed panel fastening problems. Write for Catalog No. SPF 56 today!

CAMLOC "Specialists in fasteners for Industry"

FASTENER CORPORATION

22 Spring Valley Road, Paramus, N. J.

WEST COAST OFFICE: 5410 WILSHIRE BLVD., LOS ANGELES, CAL.

tures an armature having its longitudinal resonance of about 4,000 cps., bare table.

The 1,500-lb.-force-output shaker has collinear table motion, table diameter of nine inches, 130-lb. load for 10G vector and 55 lb. load for 20G vector. Unit weighs 2,000 lb.

Calidyne Co., Winchester, Mass.

ALSO ON THE MARKET

Epoxide casting resin, Stycast 2662, can be used at temperatures up to 600 F. It pours readily and cures at low temperature; once cured heat distortion point is above 500 F. High volume resistivity is maintained at elevated temperature.—Emerson & Cuming, Inc., 869 Washington St., Canton, Mass.

Trak magnetic amplifier motor speed control measures operating speed of motor and applies an instantaneous correction voltage when load conditions threaten a speed change. Speed of small motor device equipment can be preset by conventional 2 watt rheostat. Unit can be attached to any universal (series) motor from 1/50 to 1/15 hp. rated for 115 volt operation without any wiring changes.—CGS Laboratories, Inc., 391 Ludlow St., Stamford, Conn.

Perma-Nut fastener will permanently hold two or more pieces (as a rivet) and fasten others by functioning as a nut. Radial serrations on underside of head bite into workpiece preventing fastener from turning once it has been clinched. Items can be set automatically at production rates on conventional riveting machines. Available in steel, brass, or 5056 aluminum, in seven standard styles with head diameters ranging from 3/16 in. to 13/32 in.—Tubular Rivet & Stud Co., Wollaston 70, Mass.

"Egghead," fast neutron survey meter, measures radiation at any single moment and provides readings in milli reps per hours. Item has phone jack for audible detection. Readings are made in three ranges: 0-7.5 mrep/hr.; 0-75 mrep/hr.; 0-750 mrep/hr. Line and portable models are available.—National Radiac, Inc., 475 Washington St., Newark 2, N. J.

Miniature modular pulse generator provides time base with millisecond accuracy. Called "Chronopulse," it is expected to be a more accurate timer for event, program or sequence in aircraft or missile operations. It is able to withstand extreme environments and requires little current. It is now being used in the production of rocket and missile intervalometers.—Abrams Instrument Corp., 606 E. Shiawassee St., Lansing 1, Mich.

Multiple wire thermocouple gland provides easy entrance into pressure vessels of 1, 2, 4, 6 or 8 wires. Glands may be used at temperatures ranging from −300 F. to +1850 F.; range of temperature and pressure is determined by type of sealant used. Units can be furnished with standard threads, with or without conduit connection threads and open end protection tubes.—Conax Corp., 7811 Sheridan Drive, Buffalo 21, N. Y.

Bondized Kelon-T sheets and tape specially treated on one or both sides can be cemented to a variety of materials or to itself. Tape is available in thicknesses ranging from .005 in. to .125 in. up to 24 in. in width; sheet is available in thicknesses from 1/32 in. to 1½ in. and 12 x 12 in. standard sheet sizes.—Shamban Engineering Co., 11617 West Jefferson Blvd., Culver City, Calif.

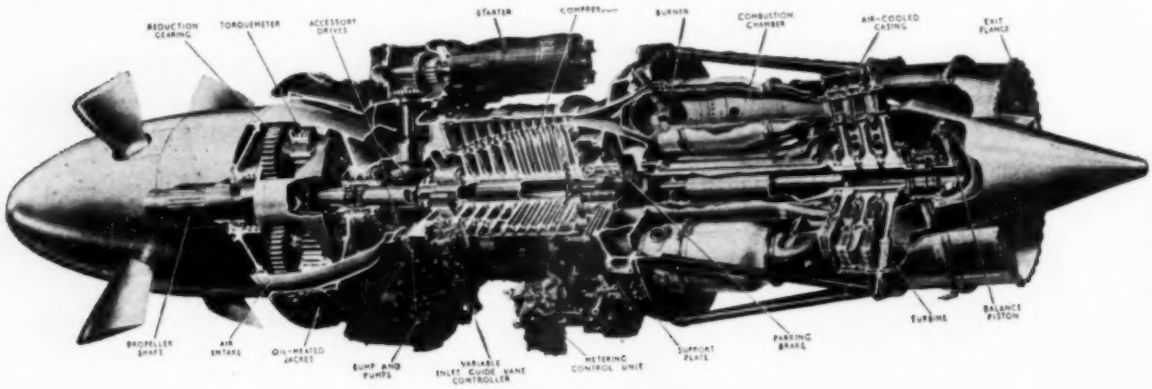
Super-soft non-porous rubber, compound RRD-992, can be securely bonded to metal. Material has a softness characteristic of 5 durometer and can be used in temperatures up to 200 F.; it is made in sheets or strips up to 1 in. thick.—Roth Rubber Co., 1860 South 54th Ave., Chicago 50, Ill.

O-ring compound 49-091, a 90 durometer synthetic material, has been developed for molded seals in service up to 300 F. with MIL-L-7870A grease for lubricating aircraft instruments and MIL-L-6083 oil for preservative purposes in hydraulic equipment.—Rubber Products Division, Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

High torque hysteresis timing motor, series A2334, is designed for high volume applications. Torque rating 10 in. ozs. at 1 rpm. Speeds 1, 2, 4, 6, 8 and 10 rpm in right and left hand rotation. Item can be supplied in 115 v. or 230 v., 60 cycle.—Hayden Mfg. Co., Inc., 245 East Elm St., Torrington, Conn.

Flight suit for private and business plane pilots is modeled after one-piece flight line suit. Adjustable sleeve and ankle straps may be tightened to eliminate wind flapping; breast and thigh pockets.—Lion Uniform, Inc., 44 Webb St., Dayton, Ohio.

Model 05 exciter voltage regulator is designed to hold a 115V, plus or minus 1¼% RMS exciter voltage over a range of 380-980 operating frequency and has an operating life of 3,000 hr. or more. It is primarily intended for B-1 alternator systems. Overall size: 10 in. long, 5⅞ in. wide, 6⅜ in. high. Weight: 18¼ lb.—Cline Electric Manufacturing Co., 3405 West 47th St., Chicago 32, Ill.



Napier Eland Engine

Dissected Eland is latest cutaway drawing of Napier turboprop engine now rated at 3,000 eshp. and aimed at the 4,200 eshp. mark in development. Napier has converted a Convair 340 to Eland power as a demonstrator to show the ability of the engine and to have a direct standard of comparison for the performance of the Eland-Convair as against a standard 340. Company is making an extensive effort to sell the Eland as a replacement engine for earlier piston engines which power the majority of the world's transports.

Navy Commissions Helicopter Carrier

San Francisco—Navy's experimental first helicopter assault carrier, the former escort carrier Thetis Bay, has been recommissioned after an $8-million conversion at the San Francisco Naval Shipyard.

Thetis Bay represents a new concept of amphibious warfare brought about by the advent of nuclear weapons. Under a new Marine Corps doctrine of vertical envelopment, Thetis Bay and others like her would launch troops in helicopters at dispersed places 50 mi. from a beachhead, eliminating bunched waves of landing craft and beachhead concentrations of support ships.

1,000 Marines

Twenty 8-man HRS-type helicopters and 1,000 Marines can be carried by the Thetis Bay, which will iron out the wrinkles in the new amphibious doctrine. Eventually a carrier will be built from the keel up as an assault carrier and equipped with larger, faster types of 15-20 man helicopters which are being built, the Navy says.

Most obvious change in the Thetis Bay is the installation of an elevator at the extreme aft end of the flight deck (see photos) to allow room for the large helicopters under development.

The forward center line elevator was removed, and the forward section of the vessel was converted to troop berthing space, spare parts stowage and shops for servicing helicopters. Helicopters are parked in the remainder on the hangar deck and on most of the flight deck.

Access routes and hatches have been revamped to facilitate movement of troops from quarters to helicopter takeoff positions on the flight deck. The original gasoline installations for airplanes has been retained, but refueling stations on the deck have been changed for helicopter operations.

Non-essential or obsolete installations including catapults and arresting gear were removed to maintain the limiting draft of the vessel.

Living Space

Housekeeping changes were numerous. There had to be larger mess rooms, galleys, sculleries, laundry spaces and storerooms.

Cargo elevators had to be installed to bring up Marine ammunition and equipment stowed below. Gasoline drums for Marine trucks and jeeps are stowed forward below decks and are carried to the flight deck by a new elevator hoist.

Island structure was rearranged and re-equipped to adapt the pilot house

HEAVY DUTY ELEVATOR for large helicopters is installed in aft end of flight deck.

CATAPULT AND ARRESTING GEAR engines are removed at San Francisco Naval Shipyard.

HUP TANDEM ROTOR helicopter lands aboard Thetis Bay. Modified island in background.

and steering station for the combined, land, sea and air control requirements. Additional control rooms and electronic spaces on the galley deck augment island controls, and additional generator capacity was necessary for this gear.

Thetis Bay displaces 10,400 tons fully loaded, is 517 ft. long and will steam at about 18 kts. There will be a crew of 500 sailors and 40 Navy officers aboard besides the Marine troops.

As a carrier, Thetis Bay will operate under the type command of Vice Adm. Alfred M. Pride, commander air force, Pacific Fleet, but for the most part will be under operational control of Vice Adm. Carl Espe, commander amphibious force, Pacific, with headquarters at Coronado, Calif. Capt. Thomas W. South II is commanding officer of the carrier, which has the Navy designation CVHA-1. (CV for carrier, HA for helicopter assault, and the Number 1 for first of a class.)

Flight Test Facility Planned at Palmdale

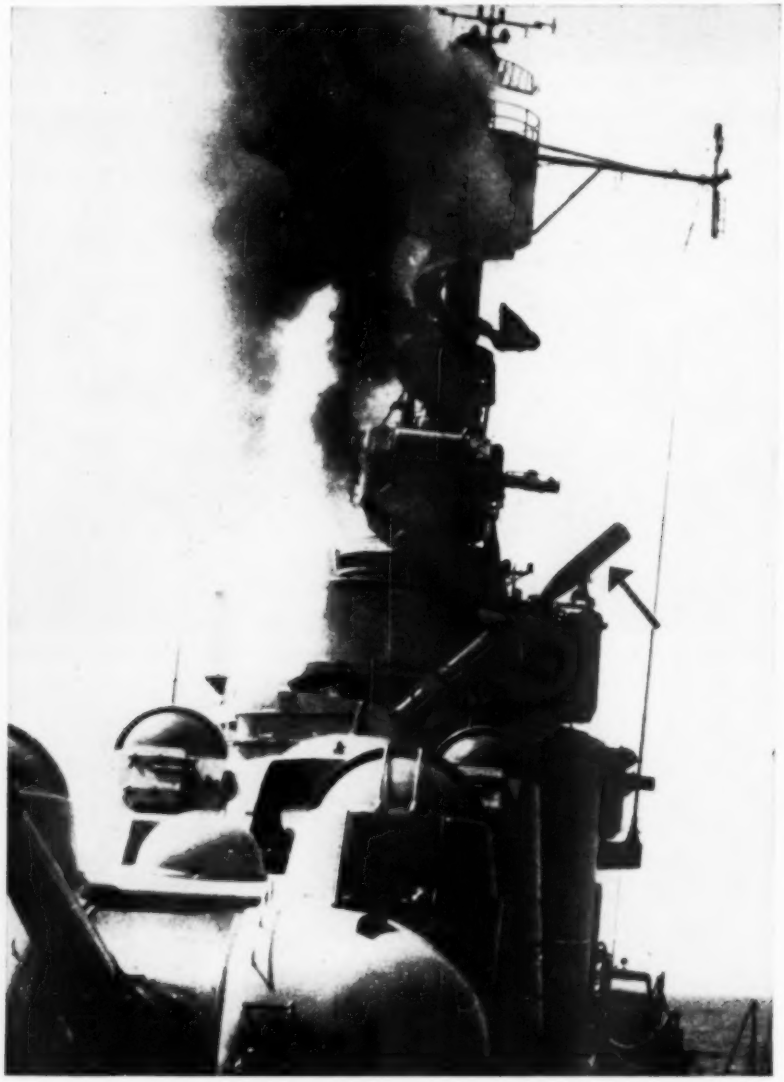
Los Angeles—A $5 million contract to construct a government owned facility for production flight test operations at the Air Force's Palmdale, Calif., airport, has been awarded to North American Aviation, Inc.

Contract provides for the construction of 247,000 sq. ft. of new buildings, including a hangar, shop stockroom and auxiliary structures, in addition to about one million sq. ft. of outside areas such as taxiways and parking and work areas. Facilities are scheduled for completion by January 1958.

Flight ramp is expected to be ready by January 1957.

The new facility will permit North American to move all production flight operations, other than initial flight of planes from Los Angeles to Palmdale, off the Los Angeles International Airport.

In addition to flight testing, other work at the new facility will include checkouts on fuel systems, engines, radios, radars, armament and other installations.



Rocket Leaves Launcher

Anti-submarine rocket (arrow) is stopped by fast shutter of camera as it emerges from launcher aboard the destroyer leader Wilkinson at sea off Boston. Rocket, exploded by proximity fuse, is being tested for anti-submarine defense. Flash of launching is diverted harmlessly upward, past inhabited portions of the vessel.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

DAYTON AF DEPOT, Gentile AF Station, Dayton 19, Ohio.

Gilfillan Bros, Inc., 1815 Venice Blvd., Los Angeles, Cal., 31 items of switches, transformers, coils, coil, RF: fuseholder, supressors, reactor, var. quantities, $31,510.

General Electric Co., Aircraft Gas Turbine Div., Evendale, Ohio, 7 items of simulator testers, fuel test stand assy, fuel pump test stand assy, lube and scavenge pump stand assy, main fuel regulator test stand assy, lube accessories test stand assy, and receptacles, var. quantities, $272,270.

Aerotec Corp., Comly Ave. and Pemberwick Rd., Greenwich, Conn., switch-press SPDT Aerotec P/N M893 WY, 400 ea., switch-press SPST Aerotec P/N M101BE, 500 ea., switch-press SPST Aerotec P/N A2002E, 50 ea., switch-press SPST Aerotec P/N M1009, 100 ea., switch sensitive SPDT Aerotec P/N AER 227, 100 ea., switch-pressure SPDT Aerotec P/N P1205, 520 ea., (RFP 35-604-56-3052), $105,415.

Westport Development and Mfg. Co., Inc., 345 Boston Post Rd., Milford, Conn., switch pressure SPST Contractor's P/N YMW90, 200 ea., switch, pressure SPST Contractor's P/N D1218, 200 ea., (RFP 33-604-56-3590 and RFP 33-604-56-3718), $26,788.

Collins Radio Co., 855 35th St., N.E., Cedar Rapids, Iowa, armature, dynamotor, mfg's P/N Collins Radio 234024600 (RFP 33604-56-3277), 4000 ea., $36,280.

Standard Electrical Products Co., 2240 E. Third St., Dayton 3, Ohio, 69 items of var. quantities for resistors MIL-R-11A type (PR-690038), $27816.

Sterling Radio Products Co., P. O. Box 1746, Houston, Tex., 41 items of var. quantities for resistors MIL-R-26B type, $43225, (IFB 33-604-56-37).

Airtron, Inc., Linden, N. J., connector-plug Airtron LC12908, 1100 ea, connector-receptacle, Airtron 12901, 800 ea, connector-receptacle, Airtron 12902, 1000 ea, connector-receptacle, Airtron LB 12903, 800 ea, (PR 643540), $39013.

Northeastern Engineering Inc., S. Bedford St., Manchester, N. H., tester-gun bomb rocket sight, type G3 in a/w Spec MIL-T-9191 dtd 11 Apr 55, 257 ea, engrg data, handbook data (RFP 33-604-56-2495), $133464.

Aero Instrument Co., 11423 Vanowen St., N. Hollywood, Calif., switch-pressure, aero P/N ASIA1000-2, 836 ea, handbook data, (PR's 549824 and 239621), $57247.

Beckman Instruments Inc., Helipot Corp

Div., 916 Meridian Ave., S. Pasadena, Cal. resistor-var linear, Hughes Acft. Dwg. No. 420-68-3615, 1000 ea, $55600 (RFP 33-604-56-2349).

Wright Electronics Inc., 1519 McGee St., Kansas City, Mo. (IFB 33-604-56-158). Crystal unit, CR-1A/AR, Spec No. MIL-C-16C dtd 14 Jan 55, 42000 ea, $31080.

Leach Relay Corp., Leach Relay Div., 5915 Avalon Blvd., Los Angeles, Cal., relay, solenoid P/N AN-3380-1 and Mil Spec MIL-R-6106B (ASG) Sup 1A dtd 20 Sep 55 (IFB 33-604-56-175), 7000 ea, $105000.

Electronic Measurement Co. Inc., Lewis St. & Maple Ave., Eatontown, N. J., stroboscope, tachometer type electronic measurement Model 351A handbook data (RFP 33-604-56-2396), 458 ea, $39960.

Electrical Specialties Co., 729 Washington St., Dayton 7, Ohio. (RFP 33-604-56-2212). 20 items of var. quantities for resistors-var comp, Mfr P/N CTS-95, CTS-35, $25063.

McGuire Products Co., 206 Troy St., Dayton 4, Ohio, resistors-fixed WW, Ward Leanard 5X RFP 33-604-56-2972, 110000 ea, $30140.

Bradley Laboratories Inc., 168 Columbus Ave., New Haven 1, Conn., rectifier-metallic selenium, Bradley Model SE11X132K686 RFP 33-604-56-2811, 100 ea, $34000.

Aerotec Corp., Comly Ave. and Pemberwick Road, Greenwich, Conn., switch-float, aerotec Type No. F931W, 200 ea, switch-fuel float, aerotec Part F3001, 100 ea, switch-differential press, aerotec P/N A301-W2, 375 ea, switch-pressure SPST, aerotec P/N M-852, 200 ea, switch-pressure SPST aerotec P/N M-910, 100 ea, (RFP 33-604-56-2245), $58276.

A. W. Haydon Co., 232 N. Elm St., Waterbury, Conn., relay-motor driven nonplie up type, Haydon No. D6412 (RFP 33-604-56-3032), 700 ea, $50603.

C. B. S. Hytron, a Division of Columbia Broadcasting System, 100 Endicott St., Danvers, Mass., tube-electron military control receiving miniature, type JAN 5814 WA in a/w MIL-E-1B and ISS MIL-E-1/238A dtd 3 May 54 (IFB 33-604-56-210), 15000 ea, $25350.

Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass., tube-electron receiving triode Type JAN 5670 WA a/w Spec MIL-E-1B (IFB 33-604-56-145), 52000 ea, $126360.

Electronic Tube Corp., 1200 E. Mermaid Lane, Philadelphia 18, Pa., tube-electron cathode ray, type 5HBP7 a/w Spec MIL-E-1B and ISS MIL-E-1/379B (IFB 33-604-56-105), 100 ea, $83100.

Raytheon Mfg. Co., Microwave & Power Tube Operations, Waltham, Mass., tube-electron transmitting magnetron RK6518/QK a/w Exhibit No. 2378 dtd 13 Aug 54, 500 ea, $575000.

Raytheon Mfg. Co., Microwave & Power Tube Operations, Waltham 54, Mass., tube-electron, magnetron, type 6177 in a/w Spec MIL-E-1B and ISS MIL-E-1/666 (Navy), 500 ea, tube-electron, magnetron Type 6406/QK 428 in a/w Spec MIL-E-1C and various ISS MIL-E-1/598 (Navy), 300 ea., $535163.

Garrett Corp., AiResearch Mfg. Co., Div., 9851 Sepulveda Blvd., Los Angeles, Cal., 29 related items of var. quantities, insulators, switches & maintenance parts, $34150.

Northrop Aircraft, Inc., Northrop Field, Hawthorne, Cal., 24 items technical data, $31000.

General Electric Co., Aircraft Gas Turbine Div., Evendale, Ohio, 7 items of various quantities, Dick Insulators, Power Transformers, various wheel balancer, engine testers and console assemblies, $53451.

Bendix Radio, Div. of Bendix Aviation Corp., E. Joppa Rd., Towson 4, Md., 16 items of var. quantities, switchboxes, capacitors, reactors RF coils and inductors, $25729.

Bendix Radio, Div. of Bendix Aviation Corp., E. Joppa Rd., Towson 4, Md., 5 items of various quantities, capacitors, dials and dynamotors, $42163.

Jackson Electrical Instrument Co., 1 S. Patterson Blvd., Dayton 2, Ohio, repair of controls-transponder set, control type C-1158/APX, 1429 ea, $25007.

Sperry Gyroscope Co., Div. of The Sperry Corp., Great Neck, N. Y., 22 items various quantities, voltmeters, milliammeters, insulators, transformers, switches, relays and electron tubes, $44362.

Geotechnical Corp., 3712 Haggar Dr., P. O. Box 7166, Dallas 9, Tex., repair of 7 items, var. quantities, signal generators, audio oscillators and activities, $58022.

Cook Electric Co., 2700 Southport Ave., Chicago, Ill., repair of multimeters, range 0 1000 volt DC, AN-PSM-6, 1063 ea, $47835.

ROME AIR FORCE DEPOT, Griffiss Air Force Base, Rome, N. Y.

Rome Cable Corp., Ridge Street, Rome, N. Y., wire electrical, 25000 ft; cable power, 225000 ft., (IFB 30-635-56-188B), $42655.

Eastman Kodak Co., 343 State St., Rochester, N. Y., film, 9½" X 370', 5000 roll, (RFP 30-635-56-4483Q), $324850.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 16mm X 100', MP, camera type; film, 7" X 250', orthochromatic, gray base, (RFP 30-635-56-4474Q), $96586.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 70 mm X 400', MP, clear base, 72000 ft; film, 8" X 10", reversal, tungsten, 1815 pkg, (RFP 30-635-56-4476Q), $39838.

Bell & Howell Co., 71000 McCormick Rd., Chicago 45, Ill., film, 16mm x 50', Type III, Class A, 70000 roll, (RFP 30-635-56-4489Q), $53,200.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 35mm x 100', Type II, class N, 15000 roll; film, 16mm x 1200', color, tungsten type 774000 feet; film, 16mm x 100', color, daylight, type DLL, 4213 roll, (RFP 30-635-56-4487Q), $146,756.

General Aniline & Film Corp., Ansco Div., Binghamton, N. Y., film, 53mm x 100', type II, class A, 2500 roll; film, 35mm x 200', type II, class A, 1493 roll, film, 35mm x 400', type II, class A, 255200 feet, (RFP 30-635-56-4489Q), $55,297.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 9-12" x 180', type 1B, class N, 1500 roll; film, 35mm x 50', type II, class A, 9000 roll; film, 35mm x 1000' Kodagraph print, 2500000 ft., (RFP 30-635-56-4489Q), $143,402.

Eastman Kodak Co., 343 State St., Rochester 4, N. Y., film, 9½" x 370', type 1B, class N, 5000 roll; film, 16mm x 400', type III, class C, 160000 ft., (RFP 30-635-56-4492Q), $327,672.

General Electric Co., Electronics Park, Syracuse, N. Y., modification kit AN/MPS-14, 4 ea; modification kit AN/FPS-8 and AN/MPS-11, 190 ea., (RFP 30-635-56-4319Q), $162,823.

Bendix Aviation Corp., Bendix Radio Div., E. Joppa Rd., Towson 4, Ind., modification kit, 10 ea; modification kit, 1190 ea., (RFP 30-635-56-4293Q), $57,826.

Hazeltine Electronics Corp., 59-25 Little Neck Parkway, Little Neck 62, L. I., N. Y., modification kit UPA-35, 554 ea., (RFP 30-625-56-4289Q), $44,874.

Reeves Instrument Corp., 215 East St., N. Y., N. Y., computer AN/MSQ-1, 28 ea., computer AN/MSQ-1, 28 ea., amplifier AN/MSQ-1 and 2, 28 ea., (RFP 3-635-56-6391Q), $111,565.

Nehring Electrical Works, DeKalb, Ill., wire, electrical Nr 6 AWG Fed Spec QQ-W-341, 60428 lb., (IFB 30-635-56-300B), $40,758.

Daystrom Electric Corp., 753 Main St., Poughkeepsie, N. Y., SSM-33 teletypewriter mixer units, 410 ea., (RFP 30-635-56-5607Q), $113,019.

Radio Receptor Co., Inc., 240 Wythe Ave., Brooklyn 11, N. Y., airport control tower console AN/FRC-19B, 2 ea., (RFP 3-635-56-4324Q), $34,787.

Elastic Stop Nut Corp. of America, AGA Div., 1027 Newark Ave., Elizabeth, N. J., light runway in accordance with MIL-L-5904B-1, 1900 ea., (IFB 30-635-56-206B), $26,410.

Radio Corp. of America, Front and Cooper Sts., Camden, N. J., headset-microphone H-78A/AIC, 7202 ea., telephone receiver H-79/AIC, 2846 ea., (IFB 30-635-56-190B), $315,310.

Tower Construction Co., 2700 Hawkeye Drive, Sioux City, Iowa., tower, TACAN antenna TR-47A, 121 ea., tower, TACAN antenna AB-435, 37 ea., IFB 30-635-56-164B), $312,138.

OKLAHOMA CITY AMA, Tinker AFB Okla.

Arkin Industries, Inc., 628 Main St., Westbury, N. Y., valve safety relief, (OC-665295, OC690852), 3 items, $25,845.

Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif., valve assy-relief, (RFP 376-031-1-OC-665492), 33 items, $76,172.

Allied Ordnance Corp., 1011 E. 173rd St.,

Navy "E" for Loft Bombing

"Red Ripper" Squadron VF-11 recently became the first Navy unit in which all 14 pilots scored an "E" for excellence in high-angle loft bombing competition, the method used in nuclear drops. The "Red Rippers," stationed at Cecil Field, Fla., are commanded by Cmdr. Edward Feightner (left, kneeling).

N. Y. 60, N. Y., valve assembly—check, (IFB 34-601-56-323), 3 items, $157,798.

Temco Aircraft Corp., P. O. Box 1056, Greenville, Tex., pan-cargo ring tiedown, (RFP 345-O1F-C-97-OC-699465), 35 items, $51,385.

Electric Inc., 85 Grand St., Kingston, N. Y., spring valve hyd hand pump, (RFP 434-031-1-OC-665288), 35 items, $45,388.

WARNER ROBINS AMA, Robins AFB, Ga.

Claussen-Lawrence Construction Co., Augusta, Ga., resurfacing hardstands and base roads with asphalt plant mix, (IFB-163, Local Purchase), $114,677.

Yearwood Chevrolet Co., Warner Robins, Ga., maintenance and repair (in use) fork lift trucks, (Local Purchase), $32,254.

Edward Blake Co., West Newton, Mass., grinding machine, grill, bench type, 97 ea., (IFB-417), $34,545.

AC Spark Plug Div., GMC, Milwaukee 2, Wis., modification kits for ME-5 tracking computers, (PR-408072), $43,444.

Aro Equipment Corp., Bryan, Ohio, pneumatic drill, portable, 3/16 in, 2567 ea., (IFB-396B), $74,161.

Champion Blower & Forge Co., Lancaster, Pa., drilling machine, upright, bench, 257 ea., (IFB-429B), $27,995.

Sperry Gyroscope Co., Great Neck, N. Y., modification kits for ME-5 BNC, (PR-408-095), $406,002.

Elgin Sweeper Co., Elgin, Ill., brow fabrication machine, 36 ea., (RFP-1149), $32,-387.

Joy Mfg. Co., Michigan City, Ind., low pressure regulator kits, 1575 ea., (PR-402169), $262,757.

AC Spark Plug Div., GMC, Milwaukee, Wis., modification kit for ME-5 BNC, (PR-408094), $132,910.

Western Electric Co., Greensboro, N. C., modification kits for MD-233/APS-64 radar set, (IPR-717552), $89,700.

Sperry Gyroscope Co., Great Neck, N. Y., modification kit for ME 5 BNC, (PR-681-213), $215,018.

Western Electric Co., New York, N. Y., cable, telephone, composite, video, (IFB-93, local purchase), $1,180,787.

AC Spark Plug Div., GMC, Milwaukee, Wis., modification kits for ME-5 BNC, (PR-408087), $45,078.

AC Spark Plug Div., GMC, Milwaukee, Wis., modification kits for PP-352A/APQ-31 radar (PR-408071), $37,442.

AC Spark Plug Div., GMC, Milwaukee, Wis., modification kits for A-1A BNC (PR-681186), $247,540.

AC Spark Plug Div., GMC, Milwaukee, Wis., modification kits for FCS, (PR-427-926), $135,497.

Sperry Gyroscope Co., Great Neck, N. Y., modification kits for A-1A BNC, (PR-681-186), $48,909.

Chicago Pneumatic Tool Co., Atlanta, Ga., hammer, planish, pneumatic, pedestal mounted, 198 ea., (IFB-320), $217,206.

Sperry Gyroscope Co., Great Neck, N. Y., modification kits for A-1A and ME5 BNC, (PR-681202), $29,020.

BASE PROCUREMENT OFFICE, Eglin AFB, Fla.

Blanchard Construction Co., P.O. Box 1129, Pensacola, Fla., construction of emergency power and equipment, oxygen storage and instrumentation buildings on Eglin reservation, (PRs REFP 56-149, 163, 164; DCS/M-I-56, 46, IFB 08-603-56-648), job, $31,941.

H. W. Peerson Drilling Supply Co., 1114 Seventh Ave., South, Birmingham, Ala., construction of off-side support facilities for title VIII family housing development, Eglin Air Force Base, (PR DCS/M-I-56-39, IFB 08-603-56-554), job, $174,000.

B. B. Saxon, Contractor, P. O. Box 683, Fort Walton Beach, Fla., construction of physiological training facilities, weapons systems support building and special weapons training building, (PR REFP 56-144 and 153; IFB 08-603-56-458), job, $77,757.

Telecomputing Corp., 12838 Saticoy St., North Hollywood, Calif., data recording equipment, (PR 10D-56-966, IFB 08-603-56-541), 3 line items, $38,582.

GADSDEN AIR FORCE DEPOT, Gadsden AF Station, Gadsden, Ala.

DriAire, Inc., 132 S. Main St., South Norwalk, Conn., indicator, humidity plug 5 GM cap, 2.940 inches long, 18MM THD body, size, refillable and reusable in accordance with Spec MIL-P-6131(1) Type II and AN Drawing AN4062-11, 1800000 ea., (RFP-01-608-56-9), $230,400.

AF MISSILE TEST CENTER, Patrick AFB, (ARDC), Fla.

J. P. Seeburg Corp., 1500 N. Dayton St., Chicago 22, Ill., six airborne telemetry flight simulators, (PR No. FP-1(56)-3003), job, $74,498.

Potter Instrument Co., Inc., 115 Cutter Mill Rd., Great Neck, N. Y. printer, very high speed, (PR No. FP-1(56)-347), job, $87,573.

Panoramic Radio Products, Inc., 10 S. 2nd Ave., Mount Vernon, N. Y., panoramic calibration and indication system, (PR No. FP-1(56)-388), job, $33,196.

L. B. Smith Aircraft Corp., P. O. Box 456, Miami 48, Fla., services and materials for renovating C-54 aircraft, (PR No. 56-12523), job, $40,233.

Pan American World Airways, Inc., 135 E. 42nd St., Chrysler Bldg., N. Y. 17, N. Y., modification, repair and instrumentation of picket ships required for missile test programs, (PR Nos. FP-16(56)-412, FP-0(56)-419), job, $1,237,300.

Reeves Instrument Corp., 215 E. 91st St., N. Y. 28, N. Y., consideration and payment of the schedule as amended per contr. AF 08(600)-399(PR No. FP-1(56)-259), job, $134,459.

TOPEKA AF STATION, Topeka, Kans.

Marman Products Co., Inc., 11214 Exposition Blvd., Los Angeles 64, Cal., clamp, (RFP 14-604-56-5210), 30008 ea., $45,900.

Stratoflex, Inc., P.O. Box 10398, Fort

North American Trainer Development

Two-place jet trainer powered by Westinghouse J34 turbojet engine with inlet under pointed nose is under development by Columbus Division of North American Aviation, Inc. Designated T2J, the trainer would be suitable for carrier operation, as tail hook indicates. With thrust of 3,400 lb., trainer would have a top speed of more than 400 kts., and a service ceiling above 40,000 ft. Stalling speed would be about 65 kts. Overall length of the trainer would be 38 ft., and the span 36 ft. Range is to be in excess of 800 nautical mi.

Velvet Glove Tested on CF-100

Experimental Avro CF-100, which has pointed nose of earlier series, not blunt nose of Mk. 4, is testing Canadian designed and built Velvet Glove missiles for Canadian National Research Board. Mk. 4 rocket armament has wingtip pods holding 30 rockets each. Major RCAF item this year and next will be missile development for CF-100 and CF-105, nearing prototype production.

Worth, Tex., fitting end, (IFB 14-604-56-753), 615000 ea., $134,475.

Aeroquip Corp., 300 S. East Ave., Jackson, Mich., fitting end, (IFB 14-604-56-753), 365000 ea., $156,823.

The Weatherhead Co., Aviation Div., Antwerp, Ohio, fitting end, (IFB 14-604-56-753), 171000 ea., $165,410.

Carbide & Carbon Chemicals Co., A Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., N. Y. 17, N. Y., methyl alcohol, (IFB 14-604-56-329), 100505 gals, $46,044.

AF OFFICE OF SCIENTIFIC ARDC, P. O. Box 1395, Baltimore 3, Md.

North American Aviation, Inc., 12214 Lakewood Blvd., Downey, Calif., research-continuation on stability and transition of laminar boundary layer, (AF18(600)-786), job, $66,684.

SACRAMENTO AMA, McClellan AFB, Cal.

Consolidated Diesel Electric Corp., Ludlow & Camel Sts., Stamford, Conn., kit, T. C.T.O.s, P/N 8120-TO-35C1-3-2-506, 700 units, (P/R 5237), $27,255.

WRIGHT-PATTERSON AIR FORCE BASE, Ohio.

E. L. Barrett & Associates, Inc., Sullivan Bldg., Boulder, Colo., for non-personal services to produce 200 pkg. sales training meetings, highlighting a four (4) year Air Force enlistment versus the 6-month active duty Army Reserve plan and produce and package sales training kits and sales training meeting equipment, (IFB 33-601-56-659), job, $29,975.

SHELBY AF DEPOT, Wilkins AF Station, Shelby, Ohio.

David Clark Co., Inc., 360 Park Ave., Worcester 2, Mass., coveralls, high altitude, type MC-3 David Clark Co. part Nr. 621R and S-647, 2146 ea., (REP 33-602-56-3090), $303,015.

Westholt Mfg., Inc., 925 W. Harry, Wichita, Kans., truck aircraft engine transportation storage and repair IAW AF Dwg 51J7265, 520 ea., $97,874, data, 1 set, $350, (IFB 33-602-56-70), $98,224.

Farm Rite Implement Co., 228 North LaSalle St., Chicago 1, Ill., modification to convert 150 ea., type B-8 shelters to type B-6 shelter, $390,607, modification to convert 80 ea., type B-8 shelters to type B-9 shelters, $221,243, (PR MH-548976), total $611,851.

Kay Industries, Inc., 1401 Twelfth St., Detroit 6, Mich., trailer, lightweight shipping C97 and KC97 acft power pkg, type MC-7 IAW USAF Dwg No. 55J9109, 170 ea., $370,600, data, $825, trailer 80 ea., $150,080, technical data, $825, (IFB 33-602-56-103), total, $522,330.

KELLY AFB, Texas.

Continental Aviation & Engineering Corp., 12700 Kercheval Ave., Detroit, Mich., spare parts for J69-T-9 aircraft engines, (P.R: 02C-SA-722032 and SA-722032-1), open call.

Avco Mfg. Corp., (Lycoming Div.), Williamsport, Pa., spare parts for 0-435-23 aircraft engines, (P.R.: 02E-SA-722033 and SA-722033-1), open call.

General Dynamics Corp., (Convair Div), San Diego, Cal., kits, spare parts, data, engineering, tooling, prototype and/or follow-on installations pertaining to electronic countermeasure quick reaction capability, (P.R.: 01B-SA-646973 and SA-646973-1) (Final), open call.

Jacobs Aircraft Engine Co., Pottstown, Pa., spare parts, modification kits, components and data for R-744-11 aircraft engines (P.R: 02G-SA-500777), open call.

Wickes Engineering & Construction Co., of Iowa, 1441 Second Ave., Des Moines 14, Iowa, construction of one radar tower, scheme No. CE 55-ADC-P7-AMCSA-1EW, facility Nr 1101, (IFB-41-608-56-227), job, $41,068.

W. R. Flocks Co., P.O. Box 6077, Houston, Tex., accessories, for adapter, box wirebound, size 40" x 48" less mats, 8220-NL03210-55, 34500 ea., mats, for pallet adapter, box wirebound, size 40" x 48" less accessories, 8200-NL03210-525, 11500 ea., (PR: 19G-LP-5403, LP-5404 and LP-5405 (first partial), $49,680.

Continental Box Co., P.O. Box 1322, Houston, Tex., mats, for pallet adapter, box wirebound, size 40" x 48" x 48" x 48" less accessories, 8200-NL03210-525, (PR 19G-56-LP-5404) (complete), 11500 ea., $55,-775.

Airtron, Inc., 1101 W. Elizabeth Ave., Linden, N. J., lead assy, 4711-13298, 103 ea., lead, 4711-13410, 242 ea., cable, 4711-13935, 746 ea., cable, 4711-13936, 746 ea., grommet, 4711-20322, 500 ea., spring, 4711-20674, 1656 ea., spring, 4711-20676, 1000 ea., ferrule, 4711-21047, 100 ea., washer, 4711-21053, 500 ea., sleeve, 4711-22128, 1700 ea., socket, 4711-22579, 1656 ea., grommet, 4711-22581, 1675 ea., sleeve, 4711-22582, 1675 ea., (PR 03H-SA-641140) (2nd partial), $40,947.

Texas Aviation Material, Inc., 3930 Cedar Springs, Dallas 19, Tex., case assy., (serviceable used overhauled complete), 0235-172558, 6 ea., case assy, (serviceable used overhauled less bracket, Pratt & Whitney Part No. 215280), 0235-172558, 34 ea., (PR 02H2-SA-641472 and SA-641472-1) (complete), $26,583.

Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.

Seymour Wallace & Co., 1200 S. 8th St., St. Louis 1, Mo., blankets: insulation, (383/29081-2897G4/2/56/AERO), 120000 sq. ft., $36,528.

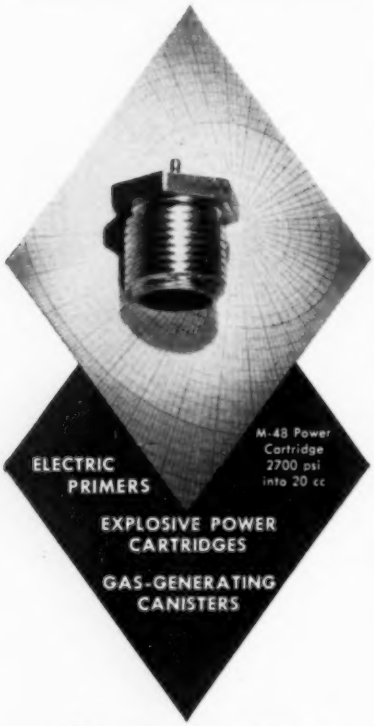
Carbide & Carbon Chemicals Co., A Div. of Union Carbide & Carbon Corp., 30 E. 42nd St., N. Y. 17, N. Y., hydraulic fluid, (38329081-2448G4/4/4/56/AERO), 32372 gals, $36,826.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., maintenance parts, (383/21117-254/51/AERO), various, $370,-794.

United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn., servicing propeller blades, (383/23055-41-P5/1/56/AERO), 690 ea., $137,274.

United Aircraft Corp., Hamilton Standard

SQUIB SPECIALISTS



An organization specializing in the design, development, and manufacture of explosive ordnance, McCormick Selph places first emphasis on dependability. The entire group is located in a 60,000-sq-ft plant on a 200-acre site having perhaps the most complete facilities of its kind in existence.

Your procurement and reliability problems in specialized explosives* can probably be solved at McCormick Selph — either with standard items, tried and proved, or with units produced to meet your specific need.

Send for data or submit your problems to:

* Ignition
Actuation
Ejection
Fracturing

McCORMICK SELPH ASSOCIATES
HOLLISTER 1, CALIFORNIA

Div., Windsor Locks, Conn., services and material to service pump assys, (383/2150-697/53/Aero, 167 ea., $40,580.

SUPPLY DEPARTMENT, Naval Air Materiel Center, Naval Base, Philadelphia 12, Pa.

Lewin-Mathes Co., 111 Chouteau Ave., St. Louis 2, Mo., tubes, copper nickel alloy (condenser and heat exchanger) in accordance with Mil Spec MIL-T-15005B, composition 90-10, (IFB 156-103-56) 156/251250/56B, 29700 lbs., $25,402.

Gardiner Mfg. Co., 2711 Union St., Oakland 7, Calif., bullets, steel bridle arrester, to be in accordance with Naval Aircraft Factory dwgs and military specification NAF part no. 316014-1, 1200 ea., hooks, steel bridle arrester, NAF part no. 316009-1, 3000 ea., shackle assembly, steel, bridle arrester, NAF part no. 316020-1, 4500 ea., die equipment for above, 2 sets, (IFB-156-125/56) 156/251308/56B, $31,335.

U. S. NAVAL RESEARCH LABORATORY, Washington 25, D. C.

Applied Science Corporation of Princeton, P.O. Box 44, Princeton, N. J., PWM/FM telemetering components consisting of the following (request for quotation 173/61674/56), transmitter, Keyer commutator, dynamotor, filter, power amplifier, blower drawings, N/C, $54,400.

U. S. COAST GUARD, 1300 E. St., N. W., Washington 25, D. C.

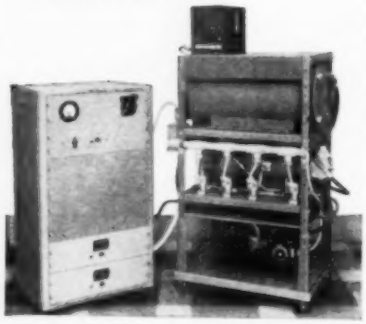
Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J., engine spare parts, tog-40234(CG-37346A), items 1 thru 104 inclusive, in various quantities, of supporting engine spare parts for Model R3350-32W engines installed on P5M-2G aircraft, $92,294.

DISTRICT PUBLIC WORKS OFFICER, Sixth Naval District Building 12, U. S. Naval Base, Charleston, S. C.

Kaminer Construction Corp., P.O. Box 227, Chamblee, Ga., high speed jet fueling facility: Marine Corps Auxiliary Landing Field, Beaufort, S. C., (NOy-91122), job, $446,798.

DYNAMIC ALTITUDE SIMULATOR

FOR TEST AND EVALUATION OF FLIGHT CONTROL EQUIPMENT AND INSTRUMENTS



Simulates actual altitude conditions of high performance aircraft or missiles in flight

Range — minus 1,000 to 80,000 ft
Max rate — 50,000 ft/min
Max response 10 cps

Write for Brochure

COLOR TELEVISION INCORPORATED
SAN CARLOS 6, CALIFORNIA
Visit Booth No. 1065, WESCON, Los Angeles

DISTRICT PUBLIC WORKS OFFICE, First Naval District, 495 Summer St., Boston 10, Mass.

Plantations Construction Co., Inc., 1089 Greenwich Ave., Warwick, R. I., Radar Air Traffic Control Center, 1st increment at the U. S. Naval Air Station, Quonset Pt., R. I., IFB Spec. 44905 B), job, $355,920.

Plantations Construction Co., Inc., 1089 Greenwich Ave., Warwick, R. I., extension to sewage treatment plant, first increment at the U. S. Naval Air Station, Quonset Pt., R. I., (IFB Spec. 44905 B), job, $355,920.

DISTRICT PUBLIC WORKS OFFICE, Fourteenth Naval District, Navy No. 128 FPO, San Francisco, Calif.

Oahu Construction Co., Ltd., P.O. Box 1326, Honolulu, Hawaii, rocket testing facility, U. S. Naval Ammunition Depot, Lualualei Branch, Oahu, T. H., (IFB 90256), job, $177,000.

NAVY DEPARTMENT, Bureau of Aeronautics, Washington 25, D.C.

All American Engineering Co., Dupont Airport, Wilmington, Del., conduct a complete analysis and design study of a high capacity arresting engine of the water squeezer type of shipboard use, NOas 56-663-d (SI-221-5835-56), $64,576.

Sperry Rand Corp., (Sperry Gyro Co., Div.), Great Neck, N. Y., compass control units and spare parts NOas 56-307-f (PD-42-1249-56), $347,106.

The Firewel Co., Inc., 3685 Broadway, Buffalo 21, N. Y., conduct a design study on various methods of supplying and regulating conditioned air for pilot's full pressure suits during flight, fabricate and furnish one (1) prototype conditioning system, NOas 56-680-c (AE-65-1902-56), $62,000.

Vertol Aircraft Corp., Morton, Pa., design, develop, fabricate and furnish a prototype helicopter rescue device also fabricate and furnish reproduction models, NOas 56-671-c (AE-52-1843-56), 7, $27,071.

Bendix Aviation Corp. (Eclipse-Pioneer Div.), Teterboro, N. J., P-1 automatic pilot components, NOas 56-581-f (PD-1241-56), 652, $2,062,475.

DISTRICT PUBLIC WORKS OFFICER, Sixth Naval District Building 12, U. S. Naval Base, Charleston, S. C.

Maurice H. Connell & Associates, P. O. Box 726, Riverside Station, Miami, Fla., initial surveys of stations 3, 4, 5, 6 and 11, Air Force Missile Test Range NBy-500, job, $75000.

Kaminer Construction Corporation, P. O. Box 227, Chamblee, Ga., high speed refueling facilities, Naval Air Station, Cecil Field, Fla., NOy-94273, job, $366710.

NAVY PURCHASING OFFICE, Washington, D. C., 4th & Independence Ave., S. W., Washington, D. C.

Frank G. Hough Co., Sunnyside Ave., Libertyville, Ill., tractor, aircraft spotting, gasoline, 15000 lbs. (N600-41584)(IFB600-948-56) Spec AER-SE7-27, 130 ea, $1003575.

Towmotor Corp., 1226 E. 152nd St., Cleveland, Ohio, truck, fork lift, gasoline, 4000 lb. cap (N600(A)41853) (IFB 600-899-56), 270 ea, $788460.

Barth Engineering and Mfg. Co., Inc., Meriden-Waterbury Rd., Milldale, Conn., radiosonde receptor AN/SMQ-1, (N600(A)-41778)(IFB 600-535-56), Spec. MIL-R-18657(Aer), 35 ea, $175723.

NAVAL AIR MATERIEL CENTER, Naval Base, Philadelphia 12, Pa.

McKiernan-Terry Corp., 505 Manor Ave., Harrison, N. J., water brake assembly, for C11-1, XC-7 and C-7 steam catapults NAF Part No. 14-5749-1, to be in accordance with NAF drawings and Military Specs., IFB Neg. 156/250666/56Q (N156s-33149), 2 ea., $28220.

Air-Craft Mfg. Corp., 837 Cherry St., Avoca, Pa., tension bars, steel holdback, NAF Part No. 402349-4 to be in accordance with NAF drawings and specs, IFB Neg. 156/251161/56Q (N156s-33198), 12000 ea, $34020.

Wallace Clark & Co., Inc., 521 Fifth Ave.,

New York 17, N. Y., management engineering services for installation of improved production control techniques to be in accordance with Spec. for Management Engineering Services, IFB Neg. 156/251193/56Q (NI56s-33136), 1 lot, $50000.

Firewel Co., Inc., 3685 Broadway, Buffalo, N. Y., back type pressure suit control system, Mk. 1 Mod. 0, to be in accordance with Mil Spec MIL-P-17844, and Spare Parts for MK1, Mod 0 and MK1, Mod 1 back type pressure suit control systems, IFB Neg. 156/251000/56Q (N156s-33132), 1828 ea., $359949.

SUPPLY DEPARTMENT, Naval Air Station, Jacksonville, Fla.

Farquhar Machinery Co., 2120 Market St., Jacksonville, Fla., shop equipment consisting of steel storage shelving, steel work benches, steel work stools, and other miscellaneous shop equipment, to be furnished and installed in Helicopter Building No. 101W., overhaul and repair department, U. S. Naval Air Station, Jacksonville, Fla., N207s-14261 IFB 207-71-56, lot, $100,358.

Army Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Army Contracting Offices:

LOS ANGELES ORDNANCE DISTRICT, 55 S. Grand Ave., Pasadena, Calif.

Northrop Aircraft, Inc., 500 E. Orangethrope Ave., Anaheim, Cal., mounts, telescope T179 series, job, $99,162.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $48,552.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $44,862.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $46,765.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $46,177.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $46,997.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike spare parts, job, $27,444.

Northrop Aircraft, Inc., 500 E. Orangethrope Ave., Anaheim, Cal., mounts, telescope T179 series, job, $40,148.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike replacement spare parts, job, $33,033.

Northrop Aircraft, Inc., 500 E. Orangethrope Ave., Anaheim, Cal., periscope and telescope, job, $81,193.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal., Nike replacement spare parts, job, $37,203.

THE ARMY SIGNAL SUPPLY AGENCY, 225 So. 18th St., Philadelphia 3, Pa.

Instruments for Industries, Mineola, N. Y. countermeasure set, electronic, AN/MLQ-8 modification, cont. No. 70085, (PR & C No. 56-ELE/D-6006), 2 ea., $45,026.

Smyth Research Associates, San Diego, Calif., evaluation of tropospheric propagation, Contract No. 67856 (PR & C No. SIGPGDCGS-2-56), job, $93,291.

Associated Missile Products Corp., Asbury Park, N. J., radio beacon AN/TRN-9 (serv. test mdl.), Contract No. 72381 (PR & C No. 56-ELC/D-5001), 2 ea., $29,033.

Gilfillan Bros., Inc., 1815 Venice Blvd., Los Angeles, California, radar set AN/FPN-33 ground approach radar for landing of craft under adverse weather conditions, Contract No. 71916 (PD No. 02-69043-01-1), 41 ea., $2,090,975.

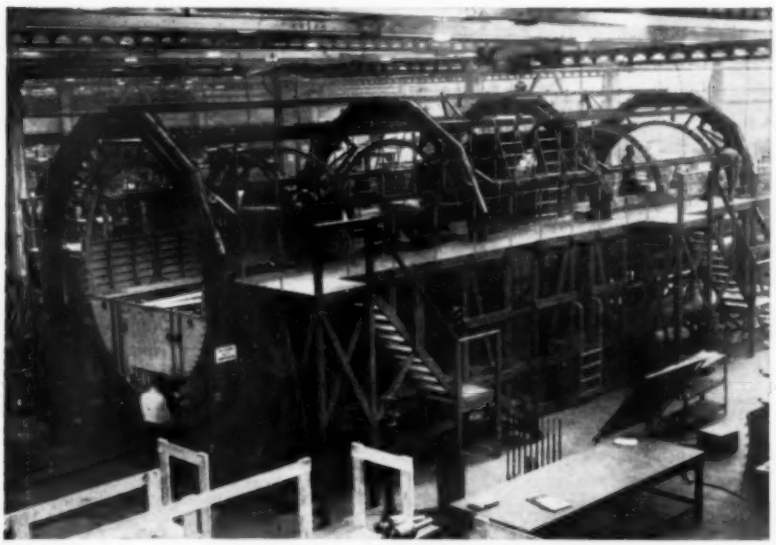
CORPS OF ENGINEERS, U. S. ARMY, Office of the District Engineer, Tullahoma District, P. O. Box 2091, Tullahoma, Tenn.

Shelby Electric Co., 106118 E. E. H. Crump Blvd., Memphis, Tenn., No subcontracts open., furnishing and installing cable troughs, consoles and miscellaneous electrical work for the Transonic Circuit of the Propulsion Wind Tunnel, Arnold Engineering Development Center, Tullahoma, Tenn., (IFB ENG-40-126-56-47), Contract No. DA-40-126-ENG-234, job, $133,333.

General Dynamics Corp., Electric Boat Div., Groton, Conn., no subcontracts open, furnishing actuators and the design, fabrication and installation of a control system for the nozzle of the supersonic circuit of the Propulsion Wind Tunnel, Arnold Engineering Development Center, Tullahoma, Tenn., (IFB ENG-40-126-56-34), Contract No. DA-40-126-ENG-235, job, $2,888,254.

CORPS OF ENGINEERS, U.S. Army, Office of the Division Engineer, New England Div., 150 Causeway St., Boston 13, Mass.

Oliver G. Kelly & Co., 98 Taylor St., Bos-



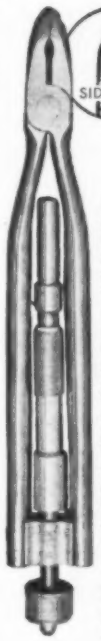
CL-28 Fuselage Jig

Center fuselage assembly jig of the Canadair CL-28 long-range, over-water reconnaissance modification of the Bristol Britannia is the largest structure of its kind ever built in Canada. It is 18-ft. 8-in. high; 26-ft., 3-in. wide; and 54-ft. long. The CL-28 is being built for the RCAF Maritime Air Command.

Now!...the NEW

ROBINSON WIRE TWISTER

with DIAGONAL GRIP-HEAD



Faster, more efficient than ever! The new, slendernose DIAGONAL GRIP-HEAD is designed especially for those narrow- hard-to-reach places. Split-second whirling action safety-wires 3 engines in time required for one by any other method . . . saves as much as $140 per engine assembled.

3-TOOLS-IN-1 . . . pliers-cutters-twisters. Side-cutting, oil-tempered head. Permanent bronze bearing. No adjustments. Jaws lock on wire, can't slip off. Perfect, uniform twist every time.

12" —for assembly line safety wiring, 15 oz. $21.50

9" —for bench work, sub-assemblies, 12 oz. $20.50

Unconditional Money-Back Guarantee. Send for complete details.

RALPH C. ROBINSON CO.
Box 494W No. Sacramento 15, Calif.

Canadian Distributor, Gensales, Ltd., Malton, Ont.

STEEL

Every Kind
Quick Delivery

Aircraft Quality Alloys and Stainless Steels also bars, structurals, plates, sheets, tubing.

RYERSON

Joseph T. Ryerson & Son, Inc. Plants: New York, Boston, Wallingford, Conn., Philadelphia, Charlotte, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Milwaukee, Chicago, St. Louis, Seattle, Spokane, Los Angeles, San Francisco

NORTH AMERICAN'S
Columbus Division

Provides OHIO Opportunities For Experienced ENGINEERS

In Columbus, thousands of professional people have found a city that satisfies an educated way of life. Columbus offers fine centers of learning and cultural opportunities.

At North American's Columbus Division, many of these people work on the completely sufficient, young but proved engineering team dedicated to one of aviation's greatest challenges—the design, development and manufacture of North American's Naval airplanes.

The highly regarded FJ-4 FURY JET is a "concept-to-flight" Columbus Division product, and stability from association with North American Aviation, the company that has built more airplanes than any other in the world . . . compose a career opportunity worth investigation by any engineer:

A SELECT FEW POSITIONS ARE OPEN IN EACH OF THESE FIELDS:

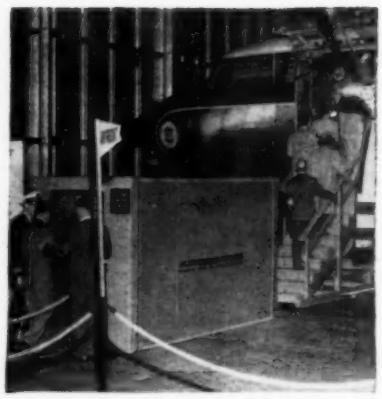
Aerodynamicists, Thermodynamicists, Dynamicists, Stress Engineers, Structural Test Engineers, Flight Test Engineers, Mechanical and Structural Designers, Electrical and Electronic Engineers, Wind Tunnel Model Designers and Builders, Power Plant Engineers, Research and Development Engineers, Weights Engineers.

For the Full Story On Your Ohio Future, Write Today: Mr. J. H. Papin, Personnel Manager, Department 56M, North American's Columbus Division, Columbus 16, Ohio.

Engineering Ahead for a Better Tomorrow

NORTH AMERICAN AVIATION, INC.

COLUMBUS DIVISION



Biggest Airfreight Box

This oversized corrugated box demonstrates the maximum size container that can be shipped in United Air Lines' new fleet of DC-6A Cargoliners. The box, made by Gaylord Container Corp., measures 12 x 6½ x 5 ft. and has walls one inch thick. DC-6A is in the background.

ton 22, Mass., furnish, deliver and erect a test chamber, Connecticut Aircraft Nuclear Laboratory, Middletown, Conn., (DA-19-016-ENG-4566), job, $417,800.

REDSTONE ARSENAL, Huntsville, Ala.

Baldwin-Lima-Hamilton Corp., 50 Moulton St., Cambridge, Mass., five items of force measuring systems for rocket launchers, (PR No. CS 6331-56), $41,942.

CORPS OF ENGINEERS, U. S. Army, 575 Riverside Ave., Jacksonville, Fla.

Empire Gas Engineering Co., 7 Baltimore Place N.W., Atlanta, Ga., construction of gap filler facilities, Bunnell Winter Garden & Inverness, Fla., (Inv ENG-08-123-56-52), job, $107645.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill., furnishing five 5000 GPM pumps with diesel engines and accessories to AFMTC, Patrick Air Force Base, Fla. (negotiated), job, $220620.

Noble Company, 1860 Seventh St., Oakland 20, Cal., furnishing and installing bridge cranes for missile assembly buildings K, L, and M, WS-107A project, AFMTC, Patrick Air Force Base, Fla., job, $420900.

RESEARCH CONTRACTING DIVISION, Tradcom, Fort Eustis, Va.

Doak Aircraft Co., Inc., 22309 S. Western Ave., Torrence, Cal., design, construction, and subsequent flight testing of a VTOL aircraft using the principle of rotable ducted fans, contract DA-44-177-TC-351, job, $341633.

CORPS OF ENGINEERS, U. S. Army, Office of the District Engineer, Sacramento District, 1209-8th St., Sacramento, Calif.

Campbell Construction Company, 1150 Folsom St., San Francisco, Cal., construction of Nike T-53 facilities (Potrero), Travis Air Force Base Defense Area, Travis Air Force Base, Solano County, Cal., Contract No. DA-04-167-eng-1551 (IFB ENG-04-167-56-41), job, $1068242.

Price McNear Construction Co., 8601 Sepulvea Bldg., Sepulveda, Cal., construction of Nike T-86, Cement Hills, Travis Air Force Base Defense Area, Travis Air Force Base, Cal., Contract No. DA-04-167-eng-1558 (IFB ENG-04-167-56-44), job, $1001112.

BOSTON ORDNANCE DISTRICT, Army Base, Boston, Mass.

Arthur D. Little, Inc., 30 Memorial Drive, Cambridge, Mass., study of 4.5 inch rocket, one item, $53740.

BUMBLEBEES CAN'T FLY!

You've heard the old story!

Rohr engineers, too, are busy every day solving near-impossible problems related to many phases of flight—important, challenging design and production problems on hundreds of vital, major aircraft components.

One example: The development and production of complex stainless-steel, honeycomb sections for high-speed aircraft and missiles.

Rohr is humming these days with more and more large military and commercial contracts.

Skilled engineers are urgently needed to grow with these big, long-range programs. Young men are offered outstanding career positions with unmatched opportunities for advancement within this large, fast-growing aircraft firm.

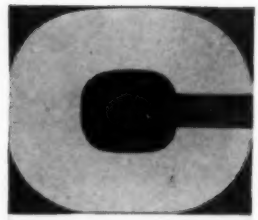
Especially needed now at Rohr are: *Design, Stress and Structures, Lofting, Equipment, Electrical, Liaison, and Aircraft Industrial Engineers, Thermodynamicists, Metallurgists.*

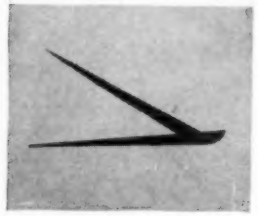
Write us today! Learn about our sound management policies, personal benefits, chances for quick advancement and other career advantages here at Rohr in beautiful Chula Vista located on cool San Diego Bay.

Please write giving complete details and we will answer at once.
J. L. Hobel, Industrial Relations Manager, Rohr Aircraft Corporation, Chula Vista, California, Dept. 29

WORLD'S LARGEST PRODUCER OF **READY-TO-INSTALL POW-R-PAX FOR AIRPLANES**

ROHR
AIRCRAFT CORPORATION





How did **CESSNA** *raise* **$5,000,000** *of New Capital?*

THE PROBLEM:

As a result of a dynamic increase in sales from $7,160,000 in 1950 to $50,000,000 in 1955, Cessna Aircraft Company needed additional working capital.

THE SOLUTION:

Kidder, Peabody & Co., acting as Cessna's agent, obtained $5,000,000 on favorable terms by placing privately this amount of promissory notes with a number of institutions. Analyzing the financial needs of large and small corporations and raising capital when necessary is an important part of our business. You are invited to call on us if our services will be of benefit to you.

KIDDER, PEABODY & CO.
FOUNDED 1865
Members New York and American Stock Exchanges
Members Boston and Midwest Stock Exchanges
17 WALL STREET · NEW YORK 5, N. Y.
BOSTON CHICAGO PHILADELPHIA SAN FRANCISCO

BANK OF MEXICO B-25 is a dual-purpose business transport; it carries 12 passengers and has a retractable vault for gold.

Business Plane Decoration Volume Grows

By Erwin J. Bulban

A rising volume of executive aircraft interior decorating business is expected to double the income of Horton & Horton Custom Works, Ft. Worth, Tex., this year. Two years ago, the company moved from Houston to its present Meacham Field quarters because it needed more space.

"At first, the new building was more than ample," William Horton told AVIATION WEEK. "Now we're cramped."

Since the move, the number of employes has more than tripled.

H&H's production record in the past 18 months: complete interiors for 224 twin-engine business planes, plus a considerable number of helicopters. It does all of the interiors for Aero Design & Engineering Corp., (it has completed about 300 Aero Commanders to date, including the one used by President Eisenhower); the Riley-Temco Twin-Navion and executive models of the Bell 47H and 47J. It is currently running five Aero Commanders weekly through its shops, with the planes coming directly from Aero Design's Bethany, Okla., factory during the course of their shakedown trials prior to customer delivery.

Switch to Planes

The husband-and-wife team of William and Dorthe Anne Horton started in the interior decorating business in 1951, operating two shops in downtown Houston. They handled custom dressing up of automobiles, offices, hotels and boats.

Another facility at the municipal airport catered to aircraft.

Two years ago the business grew to the point where they couldn't properly keep track of both types of operations. By then the aviation bug had bitten them and they sold the other interests and concentrated on business aircraft.

This year they expect to do a half-million dollars worth of plane interiors, William Horton estimates. Since 1951 through 1956, they will have done interiors on over 500 twins, he says.

Decorating an airplane interior calls for a variety of natural and synthetic materials, which must be tested for

EXECUTIVE MODEL Bell 47Hs and 47Js are sent to H&H by manufacturer for interiors.

THE HORTONS: William and Dorthe Anne.

four times before it fit perfectly.

ing the backrests. These are made by

OIL COMPANY DC-3 has work area (foreground) separated by curtain from rest area.

ROOMY EFFECT is provided by decorator's use of light colors in Aero Commander twin.

ARTHUR GODFREY'S LATEST: Bell 47H helicopter with pale blue interior.

DH DOVE passenger seats have retractable leg rests, reclining backs.

durability, lightness, and color fastness. Usually this is done by applying new materials to static test models, such as aircraft seats, which are strategically placed around the shops and office where they get a maximum of use and draw customer comments. These tests help to determine where the materials will find their best use. Some materials cannot take continuous weight, but are useful in rounding out non-weight-bearing or decorative surfaces.

Materials Trends

Among the new aircraft interior materials getting a heavy play at H&H: a quick-setting adhesive developed by Minnesota Mining & Manufacturing Co.; rolled genuine leather in continuous strips eliminating splices made by Lackawanna Leather Co., especially skived for lightness; lightweight polyurethane, by Dryden Rubber Co., to replace foam rubber rug underlays; Dryden's Nukraft, a rubberized hog's hair composed of swirled figure eights, used in seat construction.

Tomorrow's materials, the Hortons believe, will include seating pads with the upholstery integrally bonded to the cushion; flexible window frames and parts with color inlaid and baked-in, eliminating painting and subsequent nicking; spun glass and synthetic asbestos for curtains and headlining that will be vermin, fire and fade proof.

The trend in colors is to the lighter and brighter, getting away from dark blues, greens, browns and grays.

Price is not the best criteria for materials, Horton notes: "Some of the most expensive are the least durable; sometimes the converse is true."

Bomber With Gold Vault

One of the most difficult interior jobs given Horton & Horton was the interior redesign of a war-weary North American B-25 for the Bank of Mexico. The assignment: a dual-purpose interior that would comfortably seat 12 passengers, with sleeping accommodations for two, and also be suitable for hauling gold bullion.

H&H lined up a crew of four painters, four helpers, ten upholsterers, two seamstresses and several detail workers.

They insulated the spaces between stringers and stiffeners with fine spun glass, in some places 6 in. deep. This was covered by a blanket of similar material.

A major problem was getting on the headlining without taking up valuable space. Metal rods were cut to size and bent into arches, no two exactly the same, and were sent to a Houston coil spring company to be tempered, primed and lacquered.

The dove-gray wool broadcloth headliner had to be basted to the arches

four times before it fit perfectly.

Another problem was the seats. The seats installed had come from a plane used by Fleet Adm. Chester Nimitz and were only a few inches above the floorboards. Technicians built the framework up 15 in., the first 5 in. laminated gum wood. Over that went interlaced nonstretching webbing, then a layer of light Marshall spring units individually muslin encased. Fireproof twill covered this initial section of the seat.

Seats Finished

The second section started with 2 in. of rubberized hog's hair; 2½ in. of rubber foam-cored stock and muslin were added. When completed, the seats were covered in self-patterned wool twill shot with metallic thread, with overhanging waterfall cushions and leanbacks of dust blue genuine leather.

Covering seats with leather is an H&H specialty, employing what it terms "true channels." Channels are the vertical rows of puffed leather forming the backrests. These are made by drawing lines on the leather and its muslin backing, the lines on the muslin closer spaced than on the leather so that when they are sewn together the leather puffs out. Into the puff, or channel, specially ginned fireproofed cotton is inserted.

Five of these seats went into the cabin, each having individual oxygen outlets and ashtrays. Two adjustable leather-covered card tables fitted under the windows, which were framed with balsa wood, padded and leather covered.

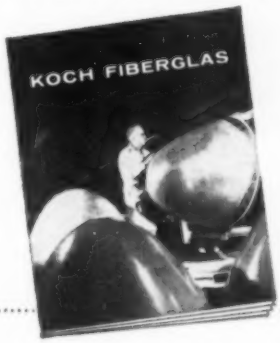
Into the bomb bay area went an hydraulically operated vault for gold storage. The sleeping bunks fit above the vault. A horseshoe-shaped seat between the sleeping lounge and flight deck seated another five passengers.

The interior decorating firm also does a good business in selling its special seats and other cabin fixtures, as cabins and commodes, to conversion centers. It has given up doing painting, subcontracts this job out to specialists.

Piper Flight Tests New Comanche

While number one Piper PA-24 Comanche four-place business plane is flight tested at Lock Haven, Pa., the number two airplane is being completed to undergo extensive field service trials. The factory has largely cleared out the Comanche's future production area and plans to hire approximately 500 additional personnel by year's end for this project. PA-24 production begins late this year and will hold at a rate of about one a week into early 1957, later will increase to two planes a day.

Have you received your copy?



VALUABLE NEW
TECHNICAL DATA
DESIGN IDEAS
MATERIEL INFORMATION

Send for
"Introduction to
Fiberglas Fabrication"
by
KOCH FIBERGLAS
FREE!

TENTH ANNIVERSARY 20-PAGE ILLUSTRATED MANUAL

Every day, Koch Fiberglas is filling new uses in your industry

RADOMES
AIRCRAFT STRUCTURAL PARTS
JET ENGINE CASES
IMPELLER BLADES
MISSILE CONTROL SYSTEMS CASES
AIRBORNE ELECTRONIC EQUIPMENT CASES
AIRCRAFT FOOD CASES

Do you have a materiel problem? Koch Fiberglas may well be the answer.

For manual, write on your business letterhead to Dept. AWB, K-4950

KOCH
PRONOUNCED "KOKE'S
FIBERGLAS
CORTE MADERA, CALIFORNIA

One of the world's largest fabricators of molded Fiberglas products

Aft Oil Tank Locations

Engineers

OPPORTUNITIES with established flight research organization engaged in all phases of flight test work.

Flight Test

Engineers with experience in flight testing of airframes and/or flight control equipment.

Aircraft Structures

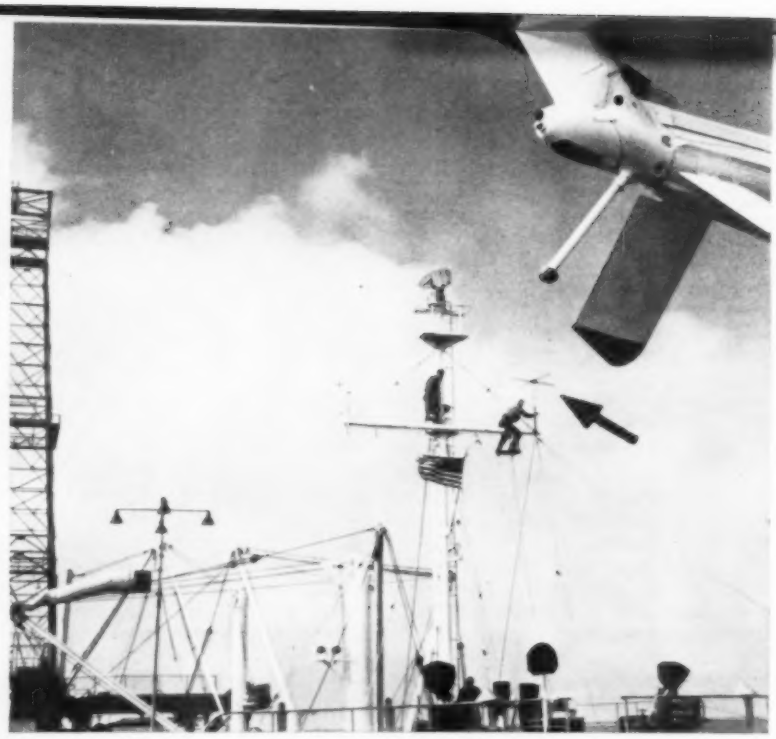
Airframe structural layout and stress analysis.

Instrumentation

Development and flight test of all forms of aeronautical instrumentation.

APPLY MON TO FRI
OR
SUBMIT RESUME
Att. MR. ROBERT STEWART
OR
PHONE FOR APPOINTMENT
RONKONKOMA 9-8086
(RONKONKOMA, N. Y.)

SPERRY
GYROSCOPE COMPANY
Division of Sperry Rand Corp.
MAC ARTHUR FIELD
RONKONKOMA, L. I., N. Y.



Unicom Units Link Oil Rigs, Aircraft

Seaborne and shore-based Unicom units provide a much-needed communications network for The California Co. in its widely scattered offshore oil drilling operations along the Southern Louisiana coastal waters. The operations are serviced by four Sikorsky S-55 helicopters, two Cessna 180 floatplanes and a Convair PBY-5A amphibian.

Formerly, a company FM frequency was used, but it was soon found impractical for handling both the aircraft and service boats, so the company installed 13 National Aeronautical Co. VGTR-2 Unicoms ashore and on offshore heliports exclusively for aircraft use. One drilling unit is 70 mi. offshore. The Unicom is providing solid ground-to-air communication to the helicopters flying at 200 ft. shortly after leaving either station.

The Narco VGTR-2s are located in the drill rig pilot houses and the antennas are on the yardarms. The standard horizontal-vertical polarized antenna systems were modified to vertical polarization using the horizontal section for ground plane. The company's aircraft transmit and receive on 122.8 kc. frequency.

Aft Oil Tank Locations Checked by CAA Agents

Installation of oil tanks in baggage compartments of spray/dust Stearman Model 75s are being checked for proper installation and effectiveness by Civil Aeronautics Administration maintenance agents.

The installation, noted during a recent CAA inspection trip, is the subject of a general branch maintenance memorandum.

Aerial applicators using this installation claim that it provides improved oil cooling over the standard location, less leakage, better c.g. condition and easier servicing.

CAA feels that there is a possibility of oil starvation during engine starting and climbs when the oil supply is low, need for winterizing the oil lines for winter operations and that the installation offers a hazard to the pilot in event of a crash.

A number of operators claim that they have been using the installation successfully for years.

The CAA memorandum outlines procedures for the agent to check on these installations. Included are a ground test with the airplane in a 15-deg. climb attitude with two gallons of oil in the tanks, the oil in the line drained all the way to the tank. A flight test procedure is also outlined:

- **Flight test** in accordance with CAM 8.10-3(c), except that no load is carried.
- **Two gallons of oil** in the tank, and oil in line drained to the tank.
- **Engine start** with airplane in ground attitude, determining that at least minimum oil pressure is attained within a reasonable time.
- **Climb power** on takeoff with best rate-of-climb angle to determine that minimum oil pressure is attained.
- **During level flight,** at full power for a maximum of one minute, it shall be determined that maximum oil pressure is not exceeded.

Helicopter Locates Old Copper Lodes

A Bristol Sycamore helicopter, loaned by Australian National Airways, located neglected copper mining claims located in the mountains of Western Tasmania.

An Australian mining firm is interested in studying the sites to determine whether it would be worthwhile to work them.

A scintillometer, carried by the helicopter, helped in pinpointing the abandoned sites. One prospector chartered the Sycamore to locate a claim he had worked many years previously, but had never properly registered.

SPECIAL CESSNA 195 trails detection unit of magnetometer for mineral survey.

Magnetometer for Small Aircraft

A new lightweight magnetometer, suited for installation in small single-engine aircraft, is being used by Hycon Aerial Surveys, Inc., Pasadena, Calif., to provide low-cost aerial prospecting service for small mineral and oil companies.

Hycon has installed the small Varian nuclear resonance magnetometers in three specially modified Cessna 195s powered by 450-hp. P&W Wasp Jr. engines in place of their standard 300-hp. Jacobs.

The extra power also permits operation at approximately 24,000 ft. for mapping work.

When used for geophysical surveys, the 195s are also equipped with a digital punch-tape recorder for transcribing data as the magnetometer develops it, 35-mm. spotting cameras and radio altimeters for maintaining an accurate track.

In addition to uranium hunting, the magnetometer equipment also spots iron, lead, copper, zinc and other ore deposits. One Cessna is now conducting aerial surveys in Alaska, Hycon reports.

The aerial survey firm operates 13 airplanes throughout the world, including two converted Lockheed P-38 fighters for high-altitude photo missions and a Convair PBY Catalina carrying over a ton of electronic detection gear including a magnetometer, scintillator and electromagnetometer.

PRIVATE LINES

J. C. Weadock of Fort Worth, Tex., sales manager of the Texas Division of the Bell Aircraft Corp., was the first pilot to land on Houston's first rooftop heliport on the Ten Ten Parking Garage. Weadock flew a Bell helicopter, the 47G-2.

Aircraft and dollar volume shipments by Beech, Cessna and Piper for June: Beech, 64 civil planes valued at $2,489,602; Cessna, 292 aircraft valued at $3,464,222 and Piper, 200 planes worth $2,016,482—all dollar volume being factory billing prices. Through June these firms have delivered nearly 3,600 business and utility planes having a

. . .No Margin For Error . . .

Celco

DEFLECTION YOKES

FOR

HIGH ACCURACY DISPLAY SYSTEMS

We specialize in the design and manufacture of precision deflection Yokes for military and commercial applications. Phone or write for immediate engineering evaluation of your critical display problems — Phone RAmsey 9-1123

Celco

Constantine Engineering Laboratories Co.

MAHWAH, N. J.

Your plant is only hours away by the Celco Air Fleet

MERCY MISSION . . .

Kaman's HOK-1 general utility helicopter, now in volume production, is designed to carry personnel, litter evacuees or cargo internally. Fitted out as a "flying crane" it can carry cargo slung externally. Equipped with a power hoist it can be used for search and rescue operations.

As a rescue vehicle the HOK got its baptism of fire in the disastrous New England floods of August 1955, and came through admirably. Kaman is proud of these mercy missions. Kaman is also proud of the part it is privileged to play in the continuing program of National Defense.

KAMAN

THE KAMAN AIRCRAFT CORP., BLOOMFIELD, CONN.

total net billing value of over $40.5 million. Included in the January-June total by the three was delivery of some 470 twins.

Auxiliary fuel system for Cessna 310 has been developed by the Wichita, Kan., manufacturer comprising two 15 gal. internal wing tanks. In addition to installing them on the line at the customer's option, Cessna also plans to make the system available as a field installation kit.

Completely automatic oxygen system for private and business aircraft will accommodate up to five people, measures 6-in. x 6¾-in. and mounts flush inside the cable. Model 707 is available from Zep Aero, 116 Sheldon St., El Segundo, Calif.

Italian Nardi F.N. 333 amphibian is slated to tour the U. S. this summer on a study of the possible market interest here in the all-metal four-placer.

Learstar rudder spring tab system may be installed on Lockheed Lodestars because of approval by Civil Aeronautics Administration under supplemental type certificate SA-4-71. Advantages of the system: full 1,350 hp. on takeoff can be used because of reduced control pressures, elimination of possibility of rudder lock, lighter control cable loads cable and pulley wear. Lear Aircraft Engineering Division, Santa Monica, Calif., is stocking modified Lodestar rudders for exchange purposes, says the installation of the system takes three days.

Denver municipal officials have reversed their previous policy of not permitting private companies to build their own hangars at Stapleton Municipal Airport. Expansion of business flying in the area caused the administration to change its previous stand.

ENVIRONMENTAL ENGINEERS

Challenging opportunities in environmental research and development. Interesting assignments in the field of inertial navigation including:

Shock and Vibration studies
High and Low Temperature Investigation
Component evaluation

Salary—up to $12000
(Commensurate with experience)

Please send resume in confidence to:

Manager of Technical Personnel, Dept. 674

ARMA

Division American Bosch Arma Corp.
Roosevelt Field, Garden City, L. I., N. Y.

MISSILE PILOTS
GROUND CONTROLLERS

MEN WITH 1000 PLUS HOURS FLYING TIME; 100 INSTRUMENT TIME; PLUS AN ENGINEERING OR OTHER TECHNICAL BACKGROUND DESIRED. MAIN EMPHASIS ON PILOT AND INSTRUMENT TIME. TO WORK IN ADVANCED INTERCONTINENTAL MISSILE PROGRAM, WITH FREQUENT BRIEF ASSIGNMENTS OUTSIDE CONTINENTAL LIMITS OF THE U. S. WORK IS WITH STRONG FLIGHT TEST ORGANIZATION ON BEAUTIFUL FLORIDA EASTCOAST.

CONTACT:

MR. G. W. BENEDICT

North American Aviation, Inc.
ENGINEERING PERSONNEL OFFICE

19 RECTOR STREET
N. Y. 6, N. Y.

ROOM 1609
PHONE DI 4-3970

Engineering Thermodynamicist

Experienced Mechanical or Aeronautical engineer wanted for specialized research in the field of engineering thermodynamics, compressible fluid flow, heat transfer, and reaction powerplant analysis. Position involves the organization, planning, and performance of analytical evaluations of advanced powerplants for aircraft and missile applications.

Applicants should have a Master's Degree plus 5-10 years' experience in the technical phases of aircraft powerplant analysis.

For further information contact

Mr. H. W. Miller
Research Department
United Aircraft Corporation
East Hartford 8, Conn.

"Commercial Pilot with Instrument Rating, to work in the Sales Department for Distributor of Aero Commander aircraft. Midwest territory. Salary open, commensurate with experience. Work will mainly consist of demonstrations of aircraft to company executives and pilots."

P-2366, Aviation Week
Class. Adv. Div. P.O. Box 12, N.Y. 36, N.Y.

YOUNG ENGINEERS

LET US HELP YOU DEVELOP YOUR CAREER . . .

If you are 30 years or younger and have interest in automatic flight control for high performance aircraft, opportunities exist in a large established business for graduate engineers in:

- **SYSTEMS DEVELOPMENT**
- **MECHANICAL PRODUCT DESIGN**
- **ELECTRICAL PRODUCT DESIGN**
- **SYSTEMS EVALUATION**

All along the way your professional development will be aided and abetted by the management here . . . through association with experts in your field, courses at the plant, a Full Tuition Refund Plan for graduate study and frequent achievement evaluations.

REPLIES HELD IN STRICTEST CONFIDENCE

Write to:
Aeronautic & Ordnance

GENERAL ELECTRIC

Building 28, Room 406-G
Schenectady, New York

TEST ENGINEERS
DO YOU LIKE YOUR ENVIRONMENT?

Investigate the Environment created at AC for its Advanced Development Programs on Missile Guidance and Aircraft Fire Control Systems.

OUR ENVIRONMENTAL LABORATORY

is one of the most Versatile Laboratories in the country and is in the process of a Major, Permanent Expansion. Men hired will enjoy working with the finest of test equipment and facilities, together with top men of the field.

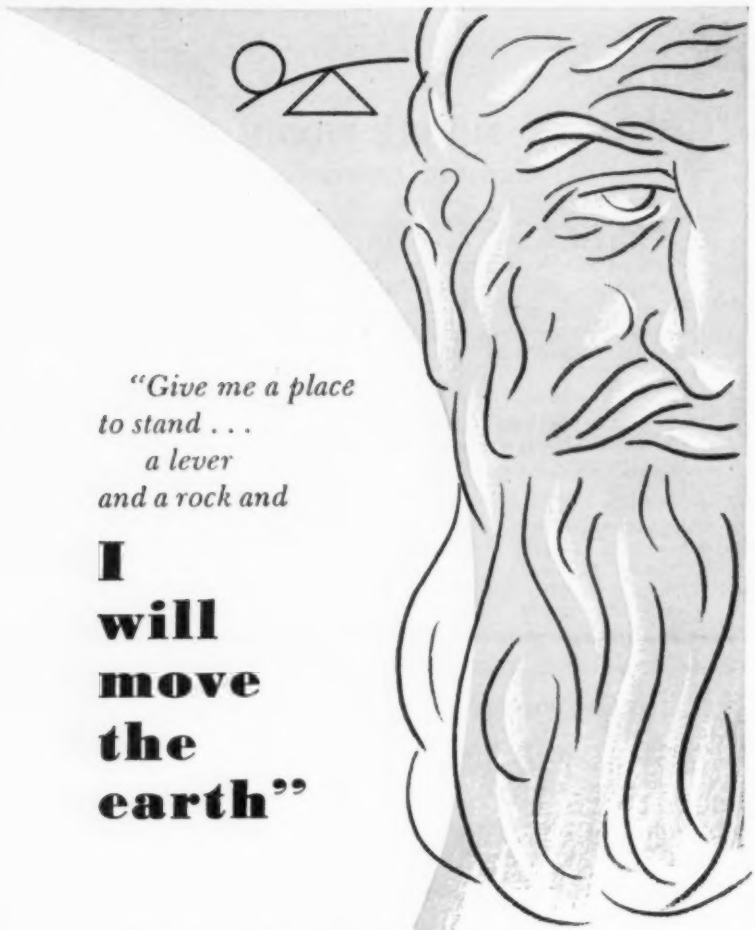
We are currently engaged in the following Types of Test Activities:

VIBRATION TESTING
COMPLEX WAVE ANALYSIS
LOW TEMPERATURE - ALTITUDE
HIGH TEMPERATURE
RELIABILITY EVALUATION
INSTRUMENTATION

Write Mr. J. Heffinger
Supervisor of Salaried Personnel

AC

The Electronics Div.
General Motors Corp.
Milwaukee 2, Wis.



"Give me a place to stand . . . a lever and a rock and

I will move the earth"

Today, as in Archimedes time, many a scientist and engineer is stymied through lack of facilities for research, development and production of an "out of this world" idea.

To such individuals, Farnsworth *is* "the place to stand, the lever and the rock" in these exciting and challenging fields: Missile guidance, control, and test equipment systems, microwaves, radar and countermeasures, infra-red systems, industrial electronics, antennas, transistor and pulse circuitry and packaging.

Your resume will receive immediate, confidential attention.

Farnsworth

A Division of IT&T

Address Technical Employment Director
FARNSWORTH ELECTRONICS COMPANY, FORT WAYNE, INDIANA
A Division of International Telephone and Telegraph Corporation

ENGINEERS

AC needs

SERVO ENGINEERS

. . . Electrical
. . . Mechanical

GM INERTIAL GUIDANCE SYSTEM PROGRAM

ELECTRONICS DIV.,
Milwaukee 2, Wis.

●

Seeks experienced engineers for the further development and systems testing of Inertial Guidance Systems and their Servo Loops.

Enjoy Challenging Opportunities in the most versatile Laboratories in the country. Work with the top men in the field and with the finest test, research and development facilities. We are in the process of a Major, Permanent, Expansion Program. New Plant facilities being added in suburban Milwaukee area.

To aid you in your professional advancement AC will provide financial assistance toward your Master's degree. A Graduate Program is available evenings at the University of Wisconsin, Milwaukee.

GM's Electronics Division aggressive position in the field of manufacture and GM's long-standing policy of decentralization creates individual opportunity and recognition for each Engineer hired.

Recent EE,ME Graduate Inquiries Also Invited

Milwaukee offers ideal family living in a progressive neighborly community in cool, southern Wisconsin where swimming, boating, big league baseball and every shopping and cultural advantage is yours for the taking.

To arrange personal, confidential interview in your locality send full facts about yourself today to

Mr. John F. Heffinger
Supervisor of Salaried Personnel

AC Electronics Div.
General Motors Corp.
Milwaukee 2, Wis.

Ceiling and Visibility Unlimited—the most encouraging forecast for pilots. And, in another sense, the same forecast—unlimited—applies to *your* career opportunities at Goodyear Aircraft.

For here is a place where you can grow. Here, your imagination and ingenuity will provide the raw materials for transforming your ideas into realities that pay off. And to help put your ideas to work, we have the most modern facilities available, including one of the largest computer laboratories in the world. At Goodyear Aircraft, every idea is a prime commodity and is given a chance to mature.

The proof is in the record. Both in peace and in war, our engineers have transformed their ideas into realities that benefit nearly every aircraft in our skies. Airships, plastics, electronic guidance and computing equipment, structures, missiles—the list is long and broad. And it's still growing.

Because of our continued growth and diversification, we find it necessary to expand our engineering staffs at both Akron, Ohio, and Litchfield Park, Arizona. Opportunities are unlimited for creative engineers in all specialties. If you have faith in your ideas and confidence in your ability to make them work, you will find at Goodyear Aircraft the stimulation of creative challenge and the satisfaction of realistic accomplishment.

Salaries and benefits are, of course, liberal. And if you wish to continue your academic studies, company-paid tuition courses leading to advanced degrees are available at nearby colleges.

For further information on *your* career opportunities at Goodyear Aircraft, write:
Mr. C. G. Jones, Personnel Department, Goodyear Aircraft Corporation, Akron 15, Ohio.

They're doing big things at

GOODYEAR AIRCRAFT

THE TEAM TO TEAM WITH In AERONAUTICS

Take command of your future

FLY AS A CO-PILOT WITH TWA

Your future is yours to command when you fly as a TWA co-pilot. You'll be flying the world's finest equipment with the world's finest airline.

JUST LOOK AT THESE ADVANTAGES — starting salary of $400 from first day of training; beginning with the third year, co-pilots receive monthly base pay and guarantee of 60 hours of flight pay; annual sick leave; paid vacation; liberal free transportation for you and your family each year; retirement plan; group insurance and many more.

QUALIFICATIONS: Aged 22 to 30; between 5'8" and 6'2"; can pass TWA physical. Must have: 400 hours total pilot time; CAA Commercial Certificate and sufficient instrument time to qualify for Instrument Rating. Two years of college or equivalent; Radio Telephone Permit Third Class

There's a wonderful future waiting for you with TWA. Get your letter off today to: Mr. R. Paul Day, Employment Manager.

TRANS WORLD AIRLINES
MUNICIPAL AIRPORT
KANSAS CITY, MO.

ENGINEER

AE ME

AIRCRAFT STRUCTURAL DESIGN
for
NUCLEAR POWER PLANTS

It is a truism that history is only made by history-makers. No one will dispute the truth of this when it comes to General Electric's pioneering work in applying nuclear energy to aircraft propulsion. Many specialized and highly qualified talents are engaged in this vital area. More are needed.

The position now open offers many opportunities for professional achievement and unique engineering experience. It involves the preliminary design of major aircraft structures, and the coordination of structural design with power plant design requirements. 4 to 6 years experience in aircraft design and development required.

OPENINGS IN
CINCINNATI, OHIO and
IDAHO FALLS, IDAHO

Address replies, stating salary requirements, to location you prefer

W. J. KELLY
P.O. Box 132
Cincinnati, O.

L. A. MUNTHER
P.O. Box 535
Idaho Falls, Idaho

GENERAL ELECTRIC

THIRTY-THREE OUTSTANDING OPPORTUNITIES FOR TOP LEVEL PROJECT ENGINEERS

Excellent positions are available for project leaders in the following fields of engineering:

Electro-mechanical Components	Servomechanisms
Circuit Analysis	Computers
Navigation Systems	Operational Analysis
Fire Control Systems	Radar Systems
Aeroballistics	Dynamic Analysis
Aircraft Structures	Small Mechanisms
Instrumentation	Rocket Propulsion
	Physicists

These are key positions in design, analysis and development of Chrysler Corporation's all-important Redstone, Jupiter and Fleet Ballistic Missile Systems.

Numerous positions also open for development and design engineers of all levels in the above fields.

Interview and relocation expenses paid.
These are permanent position in Suburban Detroit, Michigan

Address inquiries to

CHRYSLER CORPORATION
MISSILE OPERATIONS, PERSONNEL DEPARTMENT
P. O. Box 2628 Detroit 31, Michigan

GAMBLE?

sure . . . if the odds are in YOUR favor . . .

DECISION/INC—nationwide specialists in recruitment of engineering personnel—have an active and enviable record in developing job opportunities for men who want bigger salaries and a chance for greater personal achievement.

DECISION/INC is retained by more top-ranking firms thruout the nation than any other organization to *find the right man* for each job. This confidential service costs you nothing.

It takes TIME—MONEY—EFFORT to improve your job situation. If you are an engineer or scientist, particularly in the ELECTRONIC—AERO-NAUTICAL or GUIDED-MISSILE field, DECISION/INC will do this **quickly, effectively at no cost to you.**

HOW? Our placement specialist develops a plan "tailor-made" for you —which includes a resume of your experience . . . and then a review by selected companies leading to confidential interviews at **your** convenience and **our** client's expense.

NOW is the time for DECISION!
All **you** do **Now** is . . . send us your name, home address, job interest or title. We take it from there.

Write or phone:
OLIVER P. BARDES,
President—
DECISION/INC
1460-3 FIRST NATIONAL BANK BLDG.
CINCINNATI 2, OHIO
GArfield 1-1700

Publishers of the authoritative Engineers' Job Directory

we're in Milwaukee so we ought to know!

An AC* ENGINEER TELLS HIS STORY

Working at AC, THE ELECTRONICS DIVISION OF GENERAL MOTORS is exciting . . . challenges every inch of my engineering ingenuity, currently I am working on a phase of the Inertial Guidance System Program. A month or two ago I was equally absorbed in our Jet Engine Fuel Control Program. I am certainly growing ENGINEERING "KNOW-HOW-WISE" and my salary checks reflect it. I started at a good salary . . . have had regular increases in salary and position . . . gosh, I like it here.

AND, I enjoy AC's *MASTER'S DEGREE PROGRAM,* University of Wisconsin—Milwaukee. I attend evening classes and AC is paying my tuition *and* with no strings attached.

My family enjoys Milwaukee too. Here in cool, southern Wisconsin we have endless miles of swimming beaches, parks, playgrounds that are ours for the asking. We have the cultural and shopping advantages of the big city in a community long known for its small town hospitality.

P.S. AC's Permanent Expanding Electronic Program provides openings for more Mechanical, Electrical Engineers and Engineering Technicians. Even "square pegs" are provided "square holes" at AC.

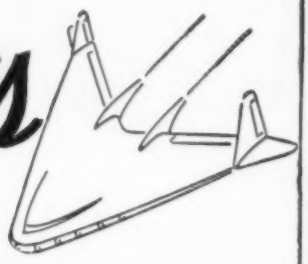
Write today in strictest confidence to my friend, Mr. J. F. Heffinger, Supervisor of Salaried Personnel.

*AC THE ELECTRONICS DIVISION

GENERAL MOTORS CORPORATION

Milwaukee 2, Wisconsin • Flint 2, Michigan

Engineers



CONTINENTAL

OFFERS YOU A WIDE FIELD FOR SPECIALIZATION

Steady expansion of both research and production facilities at Continental Aviation & Engineering Corporation creates an increasing demand for qualified engineering personnel. Liberal salary benefits and a wide range of project activities on all phases of reciprocating and turbine engine development are yours when you join the Continental staff. . . . If you hold a degree in engineering, physics or mathematics, contact CAE at the address below and investigate the opportunities that can be yours.

ADDRESS: "Salaried Personnel"

CONTINENTAL AVIATION & ENGINEERING CORPORATION
1500 ALGONQUIN AVE., DETROIT 15, MICHIGAN
SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION

WE HAVE ATTRACTIVE OPENINGS IN RESEARCH AND DEVELOPMENT FOR

Mechanical Designer—Propeller or rotor experience.
Aerodynamicist-Helicopter wind tunnel experience.
Stress Analysist-Aircraft experience.

To work on advanced ideas for helicopter VTOL's. Your resume will be treated confidentially and will receive prompt attention.

Write to: Administrative Engineer

KELLETT AIRCRAFT CORPORATION
P. O. Box 468 Camden 1, New Jersey

EXPANDING HELICOPTER PASSENGER PROGRAM HAS OPENINGS FOR:
- Passenger Reservations Personnel
- Supervising Accountant and Auditor Statistician

Airline Experience Required. Address Reply To:

LOS ANGELES AIRWAYS, INC.
Box 45155, Airport Station,
Los Angeles 45, California

EXPERIENCED
MANUFACTURING REPRESENTATIVE FOR WEST COAST

Sales engineering with good acquaintance in the industry over an extended period. Inquiries invited.

RA-2235, Aviation Week
1125 W. 6 St., Los Angeles 17, Calif.

An employment advertisement in this EMPLOYMENT OPPORTUNITIES section will help you find the engineers you need. It's an inexpensive, time saving method of selecting competent personnel for every engineering job in the Aviation field.

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Dir.
New York: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Analysts—Traffic & Economics. Executive offices in eastern city. Age 25-35 preferred. P-1155, Aviation Week.

Experienced Aircraft Instrument Technician minimum 10 years experience, Alaska area. Send complete resume first letter. P-2452, Aviation Week.

POSITIONS WANTED

Experienced Field Service Representative experience includes domestic and foreign service for leading airframe manufacturer. Domestic experience includes operational, testing and assembly and repair liaison. Foreign experience as senior European representation. Reason for change, to settle down preferably mid-west. Current salary $10,000, desire sales, service or contracts. Background college, commerce and administration. Private pilot 11 yrs. PW-2289, Aviation Week.

Desire interesting flying position. 4000 hours. Commercial MSEL Instrument, ATR soon. Navy, MATS, major airline training and experience, 2 and 4 engine. 34 years, married. College graduate, B.S. degree. Foreign location acceptable. Speak Spanish, French. PW-2393, Aviation Week.

Experienced Aviation Supplies Specialist 12 years extensive experience covering sales, purchasing, systems organization and management. Mature, responsible. PW-2447, Aviation Week.

Field Engineer. M.E. Grad., linguist. 5½ years experience on navigational and automatic flight equipment; secret clearance; seeks sales or field engineering position in Europe. PW-2483, Aviation Week.

Personnel Managers—Need experienced Engineers and Technicians? We offer a booklet especially prepared to help you solve this problem. Write for your "free" copy of "Reservoir of Engineers and Technical Men." Classified Adv.—Aviation Week, P. O. Box 12, New York 36, N. Y.

SPECIAL SERVICES TO THE AVIATION INDUSTRY

OVERHAUL & MAINTENANCE

Remmert-Werner

Inc. of St. Louis	Inc. of Florida	Inc. of Toledo
Lambert Field	Pompano Beach Airport	Express Airport
Maintenance	Conversion	Overhaul

Specialists in
Lodestar **DC3** Beech

CARTER AVIATION
Byrd Airport, Richmond, Va.
C.A.A. Approved Repair Station No. 4260
Class 1 & 3 Airframe No Limitations
Power Plant Limited
AERO-COMMANDER SPECIALIZED SERVICE
By appointment only
P. O. Box 6097 Ph. Fairfield 4670

PARTS & SUPPLIES

NAVCO INC. Lambert Field St. Louis, Mo. PErshing 1-1710
Has all Parts and Supplies for Executive DC-3 LODESTAR BEECH
Airframe Engines Radios
A.R.C. Bendix Collins Lear Sperry Wilcox
P&W Continental Wright Goodrich Goodyear

CONNECTORS
STOCK DELIVERY — AUTHORIZED DISTRIBUTOR
BENDIX CANNON IPC WINCHESTER
2102 Market St., Phila. 3, Pa., LO 7-5285
HAROLD H. POWELL CO.

OXYGEN EQUIPMENT
SALES & SERVICE
REGULATORS — MASKS — VALVES
PORTABLES & CYLINDERS
FIXED INSTALLATIONS
GOV'T. APPROVED REPAIR STATION
ZEP AERO Phone: ORegon 8-1161 EL SEGUNDO, CALIFORNIA

AIRCRAFT DEALERS

EXECUTIVE TRANSPORT AIRCRAFT
All Models - New & Used
We can save you time and money
Sales - Procurement - Trades
Leases - Finances
WELSCH AVIATION COMPANY
60 East 42nd Street Suite 729
New York 17, New York Murray Hill 7-5884

CLASSIFIED **SEARCHLIGHT SECTION** ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

PRATT & WHITNEY
1830-92 ENGINES

CAA APPROVED SHOP

Zero time since major overhaul.
Chromed Harness & Push Rod Housings
Scintilla Magnetos
New Rubber Leads
Metallized Cylinders
Standard engine warranty

3 AVAILABLE RIGHT NOW
CAN SHIP SAME DAY ORDER RECEIVED

Leeward
AERONAUTICAL SALES, INC.
P.O. BOX 210 FORT WAYNE, INDIANA

MACHINERY FOR THE AIRCRAFT INDUSTRY

Hydrotels, Kellers,
Aircraft-Type Forming Rolls

CONVERSIONS of Planers into Skin Mills

2500 Machine Tools Always In Stock

Experienced Sales Engineers Available to help fill your needs.

●

S & S MACHINERY CO.
130 53rd Street • Brooklyn 32, N. Y.
Phone: HYacinth 2-7400
Cable SANDSTOOLS

DC-3 EXECUTIVE

P & W 1830-92 Engines
Custom Interior — Air Stair Door
200,000 BTU Janitrol Heater
Empty Weight 18,025

Immediate Delivery

WE OWN THIS AIRCRAFT

LEEWARD AERONAUTICAL
P. O. Box 233 Miami 48, Florida

LOCKHEED LODESTAR FOR SALE

50 Hours on P&W engines and props SOH. Beautiful new interior. Equipped with latest Bendix radio & navigation equipment. Spare engines & parts available.

GEORGE H. BAILEY COMPANY
3508 Quimby Arcade, Fort Wayne, Indiana

EXECUTIVE DC-3

Total hours 4800. Hours since major overhaul 710. Luxuriously finished custom interior. Airstair Door. All latest navigational aids. Owned by Estate of Warren Wright. Can be inspected at Santa Barbara Flying Service.

FS-2024, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE
New Governor Test Stands Type 202 FM $700.00 Ea.
GP7 Transmitter Complete with 5 Tuning Units 500-9000 KC. New $250.00 Ea. Original Cost in Excess $5000.00
Wanted to Buy Airplanes DC3, C47, C45, Aero AT6 Commanders, Lodestars, Top Prices Paid
NATIONAL SURPLUS SALES CO.
Midwest's Largest
1800-14 Charlotte Kansas City Mo.

AIRPLANES WANTED

Need 50 Bonanzas, Navions, 180's, 170's, 170's, Aero Commanders, Twin Navions, Twin Beeches, etc.
Will Buy Dealers' Stocks New or Used
Vest Aircraft Co.'s Skyranch
BOX 5306, DENVER 17, COLORADO

WANTED

CONVAIR 240 or 340

Send Complete Information and Price to—

W-2308, Aviation Week
Classified Adv. Div.
68 Post St., San Francisco 4, Calif.

FLYING BOAT WANTED

Boeing 314 or Sikorsky S-43. Details, Price, Condition, Location First Letter

W-2450, Aviation Week
68 Post Street, San Francisco 4, Calif.

Immediate Delivery

We stock, overhaul, and install

WRIGHT	PRATT & WHITNEY
R1820	**R1830**
–202, –56, –72	–75, –92, –94

R2000 R1340 R985

and our most popular DC3 engine
R1830 - SUPER - 92

ENGINE WORKS

Lambert Field Inc. St. Louis, Mo.

Deal Directly with Owner

C18 and D18 BEECHCRAFT FOR LEASE

No deposit required—no long-term contract.

- Executive appointments
- Well equipped radio
- Full instrumentation
- Good selection

$800 monthly and up. Fly all you like. Aircraft hull insurance included. If desired aircraft available for outright purchase

TRADE-AYER COMPANY
Linden Airport Linden, N. J.
Hunter 6-7690

BEECHCRAFT TWIN BONANZA

Model C-50
Low Total Time
Full Instrumentation
Custom Radio System
Propeller Anti-Icing
Engine Preheat System

Price — $62,000.00

Write or Wire

PAGE AIRWAYS, INC.
Rochester Airport, Rochester, N. Y.
Call — Genesee 7301 — LD-139

Lockheed PV-1 Executives

N1590V — N1527V

- Zero since overhaul and conversion by Sparton.
- Latest Hydraulic Rudder Boost for easy safe single engine operation.
- Cruise 265 MPH — Range 1,650 Miles
- Interior is plush but dignified, functional flying office.
- Immediate delivery.

For demonstration or brochure — contact

WELSCH AVIATION CO.
60 East 42nd Street, New York 11, New York
MUrray Hill 7-5884

HELICOPTER

Hiller—Model UH-12B, Very low airframe and engine time.
Perfect Condition.

EAST COAST AVIATION CORPORATION
Bedford Airport Lexington 73, Mass.

Remmert-Werner
for
RADAR

Bendix **C-band**
R.C.A. **X-band**
Lambert Field **St. Louis, Mo.**

RAS INCORPORATED

"Take a Heading for Reading"

for the BEST MAINTENANCE • OVERHAUL • MODIFICATION • INSTALLATION

READING AVIATION SERVICE, INC.
Municipal Airport **Phone 3-5285** **Reading, Pennsylvania**

If you're not in the book *you're a man without*

. . . . . a country
. . . . . a state
. . . . . a county
. . . . . a town
. . . . . a party
. . . . . a street
. . . . . a school
. . . . . a *vote*

Look at all the things you can lose, if you're not a registered voter.

If you're not in the book, you lock yourself out of the elections. The polls are closed to you. You can't vote on streets, or schools, councilman or mayor (not to mention congressman, senator or president). You don't even have the right to *complain* about your government and the way things are run!

But more than that, you cut yourself apart from your neighbor next door, your friends at the shop, your fellow members in union or club.

You lose the right to look that boy of yours in the eye when he wants to know if you're doing your part.

And you lose the self-respect that comes from knowing you can walk into the polls on Election Day—the one place in the world where all free men are really equal. Isn't it too much to risk for the little time that registering takes?

Get your name in the book
—and do it now!

Is your name in the book?

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JULY 30, 1956

AEROJET-GENERAL CORPORATION 14
Agency—D'Arcy Adv. Company

AIRCRAFT RADIO CORPORATION 6
Agency—Burke, Dowling, Adams, Inc.

ALL AMERICAN ENGINEERING 69
Agency—Gaynor, Colman, Prentis & Varley, Inc.

AVRO AIRCRAFT LTD. 50, 51
Agency—Cockfield, Brown & Co., Ltd.

BASCH COMAVY, GEORGE 101
Agency—Davis, Parsons, Strohmeier, Inc.

CAMLOC FASTENER CORPORATION 75
Agency—Lewis Advertising Agency

CELCO, CONSTANTINE ENG. LAB 92
Agency—John Phillips Adv.

CLEVELAND PNEUMATIC TOOL COMPANY 24
Agency—Meldrum & Fewsmith, Inc.

COLOR TELEVISION, INC. 82
Agency—Sturgess and Associates

CONVAIR—DIV. OF GENERAL DYNAMICS 2nd Cover
Agency—Buchanan & Co., Inc.

DOW CORNING CORPORATION 68
Agency—Church & Guisewite, Adv.

ECLIPSE-PIONEER DIV., BENDIX AVIATION CORP. 7
Agency—MacManus, John & Adams, Inc.

EDO CORPORATION 59
Agency—Davis, Parson & Strohmeier, Inc.

ELASTIC STOP NUT CORP. OF AMERICA ..... 4th Cover
Agency—G. M. Basford Company

ELGIN NATIONAL WATCH CO. ORDNANCE DIV. 67
Agency—Wahlie & Briggs, Inc.

FAIRCHILD ENGINE & AIRPLANE CORP. 3
Agency—Gaynor, Colman, Prentis & Varley, Inc.

FULTON-SYLPHON DIV., ROBERTSHAW-FULTON CONTROLS CO. 4
Agency—Arndt-Preston-Chapin-Lamb & Keen, Inc.

GENERAL ELECTRIC COMPANY 8, 9, 16, 17, 60, 61
Agency—G. M. Basford Company

GILFILLAN BROTHERS 38
Agency—Erwin, Wasey & Co.

GOODRICH CO., THE B. F. 22
Agency—Batten, Barton, Durstine & Osborn, Inc.

GOODYEAR TIRE & RUBBER CO., INC. 52, 53
Agency—Kudner Agency, Inc.

HAMILTON STANDARD DIV., UNITED AIRCRAFT CORP. 20
Agency—Lennen & Newell, Inc.

HOLLEY CARBURETOR CO. 37
Agency—Holden-Chapin-Larue, Inc.

HYDRO-AIRE, INC. 13
Agency—Byron H. Brown & Staff Inc.

INDIANA GEAR WORKS, INC. 12
Agency—Bozell & Jacobs, Inc.

KAMAN AIRCRAFT CORP., THE 92
Agency—Charles Palm & Co.

KIDDER, PEABODY & CO. 86
Agency—Doremus & Company

H. KOCH & SONS 89
Agency—Weiner, Ohlesen, Reynolds, & Barker, Inc.

KOEHLER AIRCRAFT PRODUCTS CO. (NEW BRITAIN MACHINE CO.) 88
Agency—Wilson, Haight, Welch & Grover, Inc.

LOCKHEED AIRCRAFT CORP., GEORGIA DIVISION 15
Agency—Foote, Cone & Belding

McCORMICK-SELPH ASSOCIATES 82
Agency—Geeth Pacific Advertising

D. NAPIER & SON LTD. 26
Agency—C. R. Casson Ltd.

NORTH AMERICAN AVIATION, INC. 84
Agency—Batten, Barton, Durstine & Osborn, Inc.

PHILLIPS PETROLEUM CO. 5
Agency—Lambert & Feasley, Inc.

ROBINSON CO., RALPH C. 83
Agency—Chapin-Damm Adv.

ROHR AIRCRAFT CORP. 85
Agency—Barnes, Chase & Co.

RYERSON & SON, INC., JOSEPH T. 83
Agency—Calkins, Holden, Carlock, McClinton & Smith, Inc.

SERVICE STEEL DIV., VAN PELT CORP. 56
Agency—Claude E. Whipple Adv.

SHELL OIL COMPANY 10, 11
Agency—J. Walter Thompson Co.

SOLAR AIRCRAFT COMPANY 19
Agency—The Phillips-Ramsey Co. Adv.

SPERRY GYROSCOPE CO., DIV. THE SPERRY RAND CORP. ..... 90, 3rd Cover
Agency—Beach, Yates & Mattoon, Inc.

STEWART WARNER CORP. (ELECTRIC DIV.) 18
Agency—Buchen Company

SURFACE COMBUSTION CORP. (JANITROL AIR-CRAFT-AUTOMOTIVE DIV.) 54
Agency—Odiorne Industrial Adv.

WHITTAKER CO., LTD., W. R. 73
Agency—Mogge-Privett, Inc.

WICKES ENGINEERING & CONSTRUCTING CO. 101
Agency—Roland G. E. Ullman Organization

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 93-98

SPECIAL SERVICES TO THE INDUSTRY 98

PLANES—EQUIPMENT (Used or Surplus New) For Sale 99

WANTED Planes—Equipment 99

BIG or SMALL they all SHINE BEST SHINE LONGER SHINE EASIER with

NEVR-DULL
Aluminum Cleaner and Polish

The original chemically-impregnated cotton wadding — Cleans quicker, gives higher, longer-lasting gloss, leaves protective film. Saves time, labor and money! Avoid inferior imitations.

AVAILABLE AT LEADING DISTRIBUTORS

MANUFACTURED EXCLUSIVELY BY
George BASCH Co.
559 Longfellow Avenue, New York 59, N. Y.

Wickes

PORTABLE CONTROL TOWERS

Transportable by helicopter or truck. Available in a variety of models — or we will design to suit requirements. Include radio telephone transmitting and receiving equipment, aerological instruments, and field lighting control facilities.

Inset shows portable tower being raised to top of structure, using hoisting equipment supplied. Sectionalized supporting structures are available in any height up to 250 feet.

Consult us for your control tower requirements.

Wickes ENGINEERING AND CONSTRUCTION COMPANY

ESTABLISHED 1910

12TH STREET AND FERRY AVENUE — CAMDEN 4, NEW JERSEY

LETTERS

Crash Remedy: IFR

Some months ago I wrote an article for our ALPA magazine entitled "We Need 100% IFR Now." I'm no Nostradamus, but I stated that, under our present flight rules, "that accident we all dreaded, a mid-air collision between two airline airplanes, was a dead certainty."

That accident happened Saturday, June 30th. If I seem a little bitter, it's partly because Bob Shirley was one of my best friends, a gentleman and a first rate pilot.

We can put a stop to this kind of accident right now. We don't need radar, proximity warning, electronic marvels or a new $50 billion airway system. All we need is guts. Yes, guts to withstand the political pressures that permit VFR, IFR, or 1,000 ON TOP, all at the same time. Now, more than ever, we need 100% IFR—it's as simple as that.

I'm getting a little tired of being a "Target for Tonight."

Leo Kriloff
Captain
United Air Lines
San Francisco, Calif.

Unsafe to Feather

As an Air Force instructor pilot with 800 hr. of multi-engine instructor time in the past 18 months, I do not agree completely with the views expressed in the July 2, 1956, issue of your magazine by Captain R. C. Robson. I am the check pilot to whom he refers whose neck is out on every ride, and my students are inexperienced trainees, not veteran airline pilots. I have never feathered an engine near the ground and I never hope to, although I have had two complete engine failures so far this year. Both were above 3,000 ft.

While training needs require engine-out practice near the ground, I believe that such practice can be simulated. Air Force student training policy is not to feather an engine below 5,000 ft., but to use a power setting which will remove the drag from an idling prop and provide the same trim forces as in an actual engine-out situation. In case of real difficulty thereafter, the engine can be brought back into operation simply by advancing the throttle. In one instance last year one of our planes was on downwind with the left engine at the simulated feathered power setting when the right engine had sudden and complete failure. By adding power to the left engine and feathering the right engine, the pilot landed successfully. Had the left engine been feathered, he would not have had time to restart it prior to hitting the ground.

In addition, we do not even simulate engine-out procedures below 500 ft., again for safety purposes. We believe that these restrictions do not cut training realism sufficiently to offset the gain in safety, especially since our planes are twin engine only. I feel that the airline check pilots, even in their four engine transports, would be much happier if their companies adopted similar policies. Air Force Instructor

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Need Lookout Pilot

How many more deaths must we have before something is done to require at least one pilot to watch out the windshield of airline planes?

The tragic accident which took 128 lives Saturday, June 30, is another case of an airline plane running down another plane. This time the plane run down was not a small private plane, but another airliner carrying more than half a hundred people.

Accident is not the word for this crash if it happened as it appears to have happened, both airplanes above the clouds, VFR. Such so-called accidents are nothing but gross carelessness on the part of pilots who neglect to look outside their aircraft and watch for other traffic.

Ships at sea have always posted lookouts to prevent collisions, but from all that is printed it seems the larger, faster and greater number of passengers carried, the less the pilots look out the windshields of passenger planes. If the work load is too great for either of the two pilots to look out for other aircraft, then it is time for a third pilot to be required on large aircraft, a pilot whose duty it would be to look out at all times and be alert for other aircraft. Instruments, radio and all the electronic devices a plane can hold will never replace two keen eyes in flying.

It is time for this problem to be looked squarely in the face by the airlines, military, CAA and CAB and for something to be done about it. Not just some more rules aimed at keeping the private or VFR pilot out of the air, as will probably be the result of this crash even though it occurred between two airline planes. It is time the airlines recognize this hazard and instead of trying to keep small craft out of the air, clean up their own house instead and make flying safer for all of us.

George M. Sager
Duke of Gloucester Street
Williamsburg, Va.

Wrong Airplane

Just received your July 2nd issue in the mail and naturally sat right down to read it cover to cover. When I got to page 77 I had to take a second look at the top picture after reading the caption. Unless my aircraft recognition fails me, the Republic miniature bomb dispenser is attached to a wing of a F-100 instead of an F-84F as the caption stated. Looking forward to the coming issues. Angelo B. Perriello
Arlington, Va.

(Perriello and other Aviation Week readers are right.—Ed.)

Pilot Solution

Your June 11, 1956 issue contained a letter by a Mr. J. K. Carter (p. 146), concerning the "Pilot Shortage" which interested me very much.

Mr. Carter's viewpoint is one which I might have shared a year and a half ago, but not now, for I have been flying for United Air Lines this past year. My experience may give renewed hope to Mr. Carter and other "low time pilots" who wish to get into airline flying.

After completing a year of college, I was compelled to discontinue my education for various reasons. Since I had always wanted to fly, I checked with the VA and received permission to take a commercial flying course with the remainder of my G. I. Bill. After winning my commercial, I began to eye the prospects of airline flying, but at that time I, too, found that the minimum requirements for most of the airlines were greater than I could meet. There were some, however, that would accept "low time pilots." I found that a few of the airlines, United for example, would hire pilots with a commercial license only up to 28 years old, and even older fellows if they had additional ratings. (Since then the age limitations have been raised again to include fellows 30 years of age with a commercial only, and up to 32 with additional ratings.) My qualifications? I was 27 years old and had logged a grand total of *almost* 200 hours!

After completing pre-employment exams, I was assigned to United's training school for 17 weeks of intensive training that gave me an Instrument Rating, qualified me as a co-pilot on the Convair 340 and won for me a flight engineer's ticket.

I have now been flying as flight engineer for 10 months and I couldn't have asked for a greater access to the know-how and experience it takes to become a good co-pilot than serving as the third crew member. This cockpit experience gained as a flight engineer is the all important step and equalizer for us "low time" boys. I believe this more than makes up for several hundred additional hours required by some airlines, all of which may have been obtained bumping around the old grass strip every Sunday.

I will change over to the right seat in a few weeks and will do so with a great deal of confidence, because having ridden through several hundred hours as engineer, the co-pilot's job has rubbed off on me. I may be a "low time" or so called "light plane pilot," but I feel more at home in the big ones now than the little ones. I believe that is the proof of the pudding.

As my case points out—and it is no exception—the "low time pilot" once again has a crack at airline flying, just as in the pre-World War II days. In fact, I suggest Mr. Carter and other interested young fellows refer to page 138 in your June 11 issue and read once again the basic qualifications for a flight officer with one of America's major airlines. I'm sure he must have overlooked this.

United Flight Officer

NORTHWEST AIRLINES

thinks of everyone with Sperry

equipment for new DC-6Bs and DC-7Cs

SPERRY ENGINE ANALYZERS enable precise tune-ups before take-off and constant study of all ignition operations during flight...

SPERRY DUAL INTEGRATED INSTRUMENT SYSTEMS combine major flight instrumentation into 3 instruments providing more flight data in clear visual form.

SPERRY FLIGHT CONTROL SYSTEMS combining the A-12 Automatic Pilot and Radio Beam Coupler hold true courses, assure precision automatic approaches.

"On-Time" departures and arrivals—no delays while mechanics search for elusive engine troubles through old "trial and error" methods.

Precision instrumentation gives skilled pilots precise flight data regardless of weather, building traveler confidence.

A *smooth* ride, increased confidence, and additional assurance of "arrival on time."

PASSENGERS BENEFIT...

Exact knowledge of engine performance at all times permits better adjustments in flight, accurate pinpointing of troubles assuring quick repairs upon landing.

Split-second knowledge of all major flight conditions through three instruments.

Conserves energies, allows more time to monitor the overall flight.

CREW BENEFITS...

Accurate schedules attract more passengers. Better performance cuts operating costs, reduces replacement parts, prolongs life of equipment.

Added security in careful handling of a major investment—the plane itself.

Further protection of investment—and further guarantee of passenger good will and preference.

AIRLINE BENEFITS...

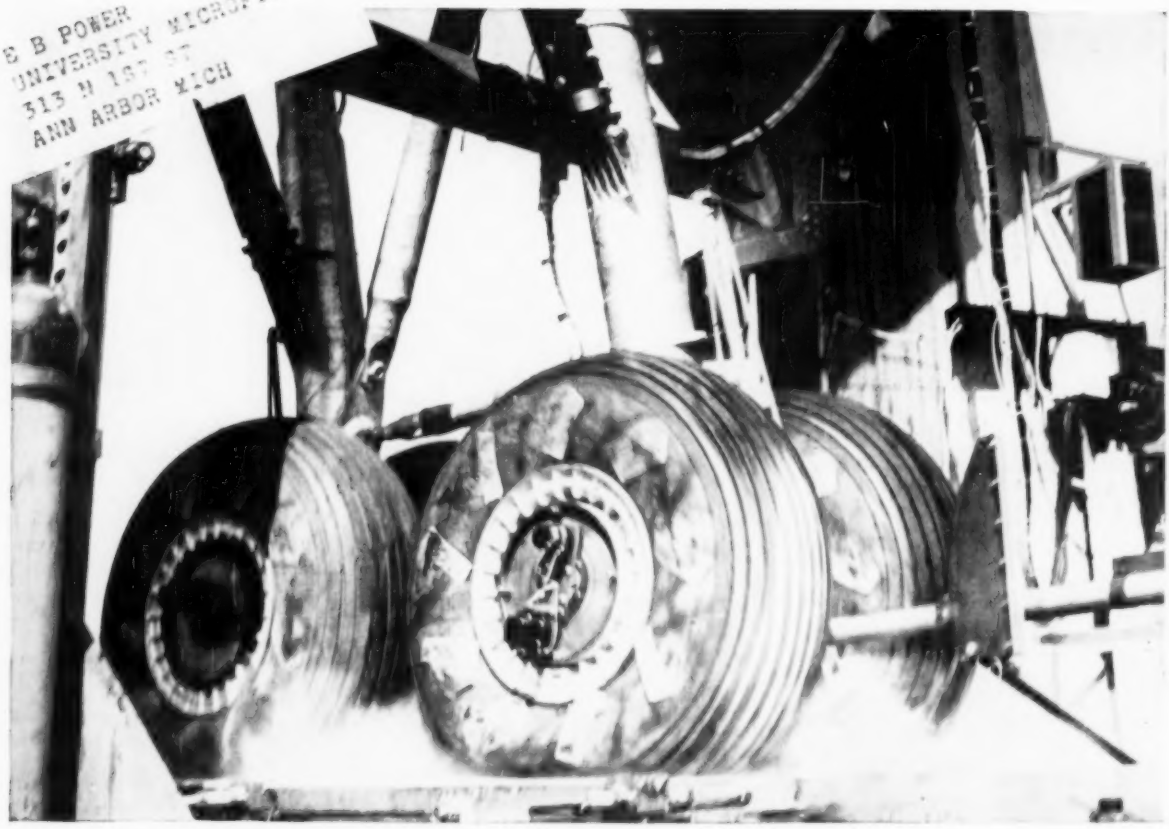
To list the airlines specifying Sperry Flight Control Systems and Sperry instrumentation would be to list "Who's Who in Commercial Aviation." For information on all Sperry developments including the new Sperry SP-30 Flight Control System for jet and turboprop transports—write our Aeronautical Equipment Division or nearest district office.

ENGINE ANALYZER IS MANUFACTURED UNDER JOHN E. LINDBERG PAT. NO. 2519417

SPERRY GYROSCOPE COMPANY
GREAT NECK, NEW YORK
DIVISION OF SPERRY RAND CORPORATION

CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES
SAN FRANCISCO • SEATTLE • IN CANADA: SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

E B POWER
UNIVERSITY MICROFILMS INC
313 N 1ST ST
ANN ARBOR MICH



On *TWA's* **SUPER-G** Lockheed Constellation's landing gear . . .

Elastic Stop® nuts pass this brutal drop test

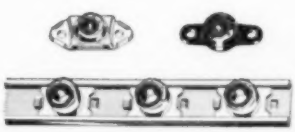
Like a bladeless guillotine, this 40-foot-high Lockheed test stand hoists landing gear assemblies aloft, spins their wheels backward 100 miles an hour, and crashes them down on its concrete base. Tons of lead weights simulate the big plane the landing gear is designed to carry.

The Lockheed experiments are directed toward development of lighter, stronger landing gear. These new units in turn demand fasteners designed for maximum resistance to fatigue failure plus the utmost dependability in terms of rated tensile performance and resistance to loosening under severe vibration and extreme shock and impact loads. Among the planes to benefit from data already secured by these punishing tests is the new Lockheed Super G Constellation, already placed in service by TWA. The Super G Connie's landing gear is only one of the many structural sections of the new plane fastened with vibration-proof Elastic Stop nuts.

Elastic Stop nuts with their familiar red locking collars have been used on every new air frame developed during the last two decades. They have performed satisfactorily under the most unpredictable test conditions . . . under normal operating conditions . . . and throughout millions of hours of rugged combat service. You can rely on flight-tested Elastic Stop nuts!

ELASTIC STOP NUT CORPORATION OF AMERICA

Dpt. N79-725 • 2330 Vauxhall Road • Union, N. J.

Red *Nylon* locking collars are standard on all ESNA fixed fasteners guaranteeing:

- vibration-proof locking
- thread sealing . . . no galling
- immediate identification
- adaptability to all shapes and sizes of aircraft fittings
- suitability to production line assembly methods
- extended reusability (ask for ESNA's high re-use Nylon Spec. #420).